Contractors and Engineers Monthly

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PICKS and SHOVELS

By O. E. POTTER

Road Building and Wine Making

It seems to be a far cry from the business of wine making to the surfacing of roads but according to a recent news item, one seems to have a very definite effect on the other after all. A report from Berlin, Germany, by Science Service appearing in the New York *World-Telegram* states that German vintners are protesting that surfacing roads through vineyard regions by the hot tar process brings bad flavor in the wine. Their theory is that the tar vapors which fill the air while the road work is going on condense on the grapes and tar particles settle on them out of the dust later on, thus imparting a tarry taste to the wine.

If this be so, it puts us ardent rooters for good roads in a difficult position. We shall have to put our inventive minds to work to find some way out of such a dilemma.

Boundaries and Blunders

A 7-mile road construction project in Massachusetts on the College Highway and extending down through the "Southwick Jog" to the Connecticut state line set us wondering about that sudden excursion into Connecticut by its northerly neighbor.

One version of it is that the first surveyors who were hired to determine the boundary line blundered rather badly, with the result that the line dips suddenly into Connecticut and then, realizing its error, hastens back to its logical course.

From the Massachusetts Department of Public Works comes the real and authentic story. The first attempt to settle the boundary between the Province

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In This Issue

Minute Tapioca Heats Asphalt

Lane Construction Co. Solves Asphalt Heating With Novel Contract—Stone Hauled 27 Miles

(Photos on page 44)

USING the facilities of a food manufacturer's permanent steam plant for heating the asphalt, the Lane Construction Co., of Meriden, Conn., completed a bituminous macadam cut-off last summer from the famous scenic Mohawk Trail at a point between Athol and Orange to U. S. 202 which runs south to Holyoke, Mass. The production of Minute Tapioca is one of the chief industries of Orange, Mass. Processing of the tapioca requires that the plant maintain a 150-pound steam pressure at all times. Inasmuch as a railroad siding runs close to the plant, the contractor made arrangements with the manufacturer to heat all of the Socony Binder C asphalt used on this penetration macadam contract. With 150 pounds of steam always available, there were no delays after a Sunday, holiday, or rainy-spell shut-down. The asphalt was always heated promptly and ready to be pumped into the contractor's distributor.

Grading

The clearing and grading started June 17, 1935, and on July 1, a single shovel was put onto the job to move about 3,000 cubic yards of rough excavation. There were three large cuts on the job, all of which were made with Carryall scrapers. These three LeTourneau 12-yard machines handled 18,000 cubic yards of

(Continued on page 23)

A 54-Inch R. C. Sewer 3,400 Feet in Length Built in Columbus

The Kalill Co. Built Sewer Contract No. 9 in Open Cut with Short Tunnel Section

COLUMBUS, Ohio, is one of the many cities in this country with a plan for public works which had been delayed because of inability to finance the program completely. When PWA came along, Columbus siezed the opportunity and has gone ahead with the construction of many intercepting storm and sanitary sewers that have greatly improved the drainage system of the city. In this group is Intercepting Sewers Contract 9, Olentangy-Scito Section, awarded to The Kalill Co., of Cleveland, Ohio, and involving the construction of about 3,400 feet of 54-inch precast reinforced concrete pipe sewer.

The contractor used a Thew-Lorain pull-type shovel to excavate a trench about 7 feet 6 inches wide and running as deep as 24 feet. The trench was sheeted continuously with 2 x 12-inch wood sheeting, using 8 x 8-inch wales and braces. The sheeting was driven with a Gardner-Denver sheeting hammer with air furnished by a Schramm compressor. The trench was dug only to about 18 feet with the pull shovel and the remainder with a Thew crane and 1-yard Owen clamshell bucket. Before placing the wales and braces, the sheeting was held with Simplex trench braces. The material excavated was clay with a considerable portion of glacial drift and gravel, making careful bracing necessary.

Setting the Pipe

A Byers crane was used for setting the 6-foot lengths of Universal concrete pipe made in Columbus with tongue and groove joints. Concrete blocks, one to a length of pipe, were set ahead of the pipe to insure an accurate grade for the invert. The blocks were curved to fit the outside of the pipe, thus making a short section of cradle. Immediately after setting the pipe in the block a continuous cradle was poured, using ready-mixed concrete supplied by a local dealer and transported in Jaeger truck mixers. This cradle was continued up to 3 inches above the horizontal diameter of the pipe, forming a backing as well as a cradle. This was required on all cuts where the cover was 10 feet or more over the top of the pipe.

Immediately beneath the pipe and ahead of laying, an 8-inch vitrified tile underdrain was laid and covered 4 inches deep on the sides and over the top with crushed limestone. This was of great help in maintaining a dry trench on most sections of the work.

The reinforced concrete sewer pipe was lined for the lower half with 1¼-inch vitrified tile plates 9 x 18 inches cast in the pipe to protect the concrete.

The Tunnel Section

At the Lane Avenue crossing of the sewer it was necessary to maintain traffic at all times because of heavy travel to a large local market. The contractor decided to make half the crossing in open cut and tunnel the remainder instead of making the entire crossing in open cut and building a heavy bridge.

Work on the crossing was started at 2 A.M. one morning, making the open cut and then starting the tunnel with 5 and 4 segment arches of liner plates. As the work progressed the 5-plate arches were blocked at the bottom with 2 x 4's and the 4-plate arches with 4 x 6-inch blocks. A double line of Simplex trench braces were used on alternate rings as vertical braces and every fourth ring had a diagonal brace with alternate braces crossing. Excavation by hand was carried ahead only one ring at a time through the stratified gravel and sand in the tunnel portion. Every ring was packed with straw to prevent any fine sand running and causing a cave-in. The contractor maintained a "safe ladder" in each deep section of the trench made of knot-free 2 x 6-inch stock firmly nailed together with two heavy spikes at each end of each rung and similarly nailed to each wale and at top and bottom.

All manholes as well as the cradle and backing for the pipe was poured from a ½-yard concrete bucket handled by the

(Continued on page 17)

AMONG THE "HEAVIES" AT THE ROAD SHOW

A Fortune in New Equipment Exhibited in Cleveland. See Page 20 for Highlights of the Show.

One Large Scraper and Ten Light Trucks Grade Secondary Road

Frank Moran Company Moved Large Yardage with Elevating Grader and Flat-Body Trucks

IOWA State Highway 48 running between two main east and west highways, U.S. 6 and U.S. 34, serves the towns of Griswold, Elliot and Stennett, and the surrounding farming district. The State Highway Commission awarded a contract to Frank Moran Co., of Omaha, Nebr., late in 1934 for the grading of the northern section of this highway for a distance of 6 miles and involving the handling of 174,000 cubic yards of earth. The contractor placed on the job an Adams No. 11 elevating grader equipped with a 42-inch belt driven by a Buda engine and pulled by two Caterpillar Sixty tractors.

Early in the spring of 1935 a LeTourneau 12-yard Carryall scraper was rented and given a try-out on this job, completing some of the short-haul fills. The scraper, which was the first to be used in Iowa, was pulled by a Caterpillar diesel Seventy-Five tractor. On side borrows, cut and fill work on hauling up to 400 feet, it moved as much as 150 yards an hour. They found the scraper especially valuable in topping out grades which had been built with longer hauling units, as it was possible to make a cut of a few tenths and to spread the dirt in equally thin lifts. The contractor was pleased with the way the scraper handled the tough Iowa gumbo with its tendency to come up in large solid chunks.

Light Trucks With Flat Bodies

A fleet of ten trucks including two Chevrolets, and six new Internationals, was used under the belt of the grader. An interesting feature of the truck equipment was that the contractor furnished home-made shallow bodies for mounting on the hired trucks. These bodies had a level measurement of 2 cubic yards but the wide bodies that extended both over the end and the sides of the chassis were loaded regularly with 3 yards of material. The large area of the body had another advantage in that it was easier to spot the body under the end of the belt of the grader and load it quickly.

The average haul on the job from cut or borrow pit to fill was between 800 and 1,000 feet but the maximum, entirely from borrow, was about one mile. The average fleet for hauling was six trucks with a maximum of ten. This combination handled 2,000 cubic yards of earth in a 12-hour day on the 800-foot haul.

All of the borrow for the fills was side borrow along the right-of-way except near the south end of the work close to the town of Griswold where about 3½ acres was taken for borrow for the longest haul.

The fills were built up in 12-inch lifts, 34 feet wide with 1½ to 1 slopes and the same for the backslope with a ditch 2 feet wide.

The equipment responsible for blading and finishing the grade consisted of a Caterpillar Sixty and an Allis-Chalmers 75 with an Adams 12-foot and a Galion 12-foot blade. Two teams with fresnos finished up around the culverts and three or four men per shift dressed slope.

Lubrication and Refueling

Starting sometimes as early as 11:30 in the morning a light truck with a gasoline and a fuel oil tank made the rounds of the equipment and refueled every piece as well as greased the tractors between starting time and the end of the lunch hour. Another greasing and fueling period came at the end of the day, 7 P.M.

C. & E. M.' Photo

The Elevating Grader Loading One of the Contractor's Shallow-Body Trucks With 3 Yards of Material

All the fuel oil and gasoline as well as lubricants for the Alemite grease gun were hauled out from Omaha, Nebr., a distance of 42 miles, from the contractor's yard there, using a service truck. This same truck made the trip with the fuel and hauled the huge 12-yard Carryall scaper through the streets of Omaha and over the state highway, much to the amazement of the populace.

It is interesting to note that the diesel Seventy-Five tractor uses a little more than two-thirds as much fuel oil as the Sixty does of gasoline. The cost is about one half for the fuel oil.

Hours and Labor

As this was a public works project, NRH 408, D & E, it was operated under the 30-hour a week restriction for labor. The contractor worked two 6-hour shifts a day from 6 A.M. to 12 noon, and 1 P.M. to 7 P.M. This required working a five-day week but the extra day was most useful in taking care of the time lost through bad weather and breakdowns of equipment. Between 18 and 25 men were worked per shift, including machine operators and unskilled hand labor.

Personnel

This project was completed at the end of May, 1935, after operating for approximately eight months. The contractor maintained a wagon camp for the skilled labor and for an office on the job. As it was Monday when this work was visited the long lines of clean wash were blowing in the wind from the wagons to the nearest telephone poles. For the Frank Moran Co., of Omaha, the work was in charge of Harold McMullen, Superintendent. J. C. McElherne was Resident Engineer for the Iowa State Highway Commission.

Slab Pushed Laterally to Widen Main Highway

New Jersey Methods of Removing Hazards on Four-Lane Highway Watched by Engineers

BY the simple expedient of inserting and inflating rubber hose and blocking against the stationary slab, a New Jersey State Highway crew moved a 28-ton slab laterally a distance of 12 feet in starting its program to create a curbed boulevard strip in the center of a four-lane highway. Why? Because accident records on the 12½ miles of U.S. Route 1 in North and South Brunswick, the Brunswick Pike, are bad; 124, 114, 118 accidents in 1932, 1933, and 1934 respectively, with the number of persons killed increasing each year, 5, 10 and 12.

The gigantic task of moving 7 miles of slab 12 feet laterally has been given the close attention of State and Federal engineers who witnessed the experimental work on the first slab which was done under the direction of Sigvald Johannesson, Designing Engineer of the New Jersey State Highway Department.

The Beginning of an Experiment in Highway Slab Moving in New Jersey

The Experimental Method

First, a plow blade carried by 6-foot lengths of 4 x ½-inch angles was used to cut out the mastic filler of the longitudinal expansion joint to a depth of 7 inches. Then, using jack hammers, a section of slab about 6 inches wide was cut out at either end, thus isolating the section to be moved.

A 2½-inch woven linen fire hose with no rubber liner was laid flat in the plowed-out expansion joint and wet slightly. Through a special connection at the end of the hose air at 50 pounds pressure was applied from a portable compressor. This moved the slab laterally about 1¼ inches. Immediately thereafter the remainder of the expansion joint filler was removed with a spade and a 2-ply 6-inch hose with a rubber lining was placed flat in the 1¼-inch slot. When air was applied to this, the slab moved about 4 inches laterally. This method was continued with the insertion of a 10 x 10 header which was blocked back to the original pavement by two or more angle irons holding vertical pieces of 4 x 10 x 18 timber as spacers, as shown in the accompanying photograph. An average of 5 minutes was required for each set-up and 4-inch shove.

When a lateral movement of 12 feet had been made, the slab was drilled at eight points and a mixture of mud and cement pumped beneath the slab by a Mud-Jack to raise it to the proper grade and to give a uniform bearing on the new subgrade.

The first slab moved was later jacked up for inspection. Examination showed that the mixture of top soil and cement had spread uniformly under the slab although part of the mixture had adhered to the slab when it was raised and the remainder stuck to the subgrade.

Work Progressing Rapidly

After the experimental work was completed, work was started on the 7-mile stretch south of New Brunswick and up to November 1, 1935, four sections of slab of an average length of 450 feet each were successfully moved 12 feet laterally by this method, using principally labor from relief rolls.

Especial care has been taken to post warning signs for every day traffic and newspapers published notices during the autumn asking the heavy football traffic to and from Princeton, N. J., on Saturdays to avoid the Brunswick road as much as possible during the progress of this work.

Personnel

The work is being done by the New Jersey State Highway Department, E. Donald Sterner, Highway Commissioner and W. G. Sloan, State Highway Engineer. The experimental field work was done and the project continued under the direction of Sigvald Johannesson, Designing Engineer, by A. W. Muir, Superintendent of Maintenance and Fred Woodruff, Assistant Superintendent. The photograph is furnished by the *Trenton Times* through the courtesy of Fred Ferris.

Federal Aid Invaluable

I shudder to thing what will happen should we never have received Federal participation or if Federal Aid were discontinued and states should map a program to build their individual highways without the cooperation of the United States Bureau of Public Roads. The incentive to match Federal Aid funds would be eliminated, giving enemies of the highway program a most powerful weapon to fight for a general reduction of construction and for further diversion of gasoline taxes and motor vehicle license fees.—Alex Hancock, Chairman, Alabama Road Builders' Association

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Retroactive Compensation Blow to Entire Industry

The amendment to the New York State Compensation Law passed in March, 1935, and effective September 1, 1935, making the law applicable to "any and all occupational diseases," has caused a major disturbance in the construction industry, including insurance carriers, employers, and labor. This amendment was part of Governor Lehman's Social Welfare Program and was pushed through as a partisan measure. It fails to define an occupational disease, it makes compensation applicable to a disease of slow contraction and which a workman may have acquired over a period of years prior to the enactment of the amendment. This would force insurance carriers to pay compensation on a man already damaged by an occupational disease and would be as unfair as requiring a fire insurance company to accept the risk on a building already burning and damaged.

The first compensation laws in New York State listed characteristic diseases of the specific occupation as distinguished from diseases of ordinary life. This list was expanded until in 1935, it was the most inclusive of any state but did not include dust diseases such as silicosis. When the Act of March 26, 1935, was in the State Legislature, insurers were willing "to extend compensation in limited form to those disabled by dust diseases, provided we might be permitted periodical examination, not by our doctor, but by the state . . ." Labor declined to accept this suggestion and the all-inclusive occupational disease law resulted.

The Compensation Insurance Rating Board demanded that the Industrial Board define "occupational disease" before any sad cases arose for adjudication, resulting in the definition, "No disease is to be considered as an occupational disease unless it be characteristic and peculiar to the occupation in which the man was engaged." This definition would be admirable if it were in the law, but the Labor Department is not bound rigidly to enforce this definition.

Silicosis is progressive, and in its latter stages is incurable. Further, it is generally deemed greatly to increase susceptibility to such diseases as tuberculosis and pneumonia. Consequently, under the present New York State law, compensation for silicosis would generally include a life pension, with unlimited medical benefits, for the diseased employee, plus pensions for his dependents. The cost, therefore, of compensation for silicosis will probably average over $10,000 per case. Insurance carriers and employers paying the premium could swing this if the liability were restricted to cases of silicosis contracted entirely in the future and all precautions for the prevention of contraction were taken immediately. But the New York Law imposes liability for future disablements by silicosis resulting more or less from exposure in the past. Thus, if contractors retain all old workmen, many of whom are not yet disabled, they assume contingent liabilities aggregating millions of dollars, in addition to the liability for future contractions of the disease by other employees.

What is the cure? The present law must be amended to limit the employer's liability compensation for silicosis within the bounds of practicability and further each occupational disease must be defined and allocated to its particular occupation. Under the guise of this Social Welfare Legislation workmen have been thrown out of employment and otherwise damaged by well-meaning friends. It is hoped that other states will be warned by the difficulties experienced in New York and will not be carried away on the wave of social welfare legislation to pass laws which will inevitably prove a burden to industry and react unfavorably upon workmen who should receive a reasonable compensation.

Steel Drum Heaters Old Stuff in Alaska

To the Editor
Contractors and Engineers Monthly:

In Article 371, page 24, of your December issue you describe the use of steel drums for heating purposes as though it were something new. This is old stuff to Alaskans. These stoves are used very commonly in cabins, roadhouses, barns, schools and residences and even as hot air furnaces.

The man who made the stoves described was not onto his business or he would have forgotten all about putting a grate in them, thus using up space and accomplishing nothing.

There should be an upright draft at the bottom about 6 inches vertical and 2 inches in diameter. No grate! Before using the stove, throw in about three shovelfuls of earth to prevent the bottom burning or warping. No man in New York State, for ordinary heating purposes, can chuck enough wood in this stove in a year to make the ash level come up to the bottom of the door.

I have used one continuously for a year with temperatures down to 62 below zero without cleaning it out and that means several months without permitting the fire to go out.

Unless the writer is speaking of ordinary lubricating oil drums, he is wrong about their not lasting. The one spoken of above was used for five years.

We also use them for upright stoves, water barrels, hot water tanks, feed troughs, hens nests, chairs, stalls and what have you.

HAWLEY STERLING
Assistant Chief Engineer
Alaska Road Commission

Juneau, Alaska
January 4, 1936

Diversion of gasoline tax and motor vehicle license fee funds already is costing the highway program approximately $200,000,000 a year. Imagine what the toll would be if the stabilizing factor of Federal Aid were removed.—Charles M. Upham.

Pavement Design in Past 15 Years

The shapes of the cross sections used in concrete pavement construction in the United States have gone through an interesting period of development during the last fifteen years. The earliest concrete pavements were laid in slabs that were either thicker in the center than at the edges or else were of uniform thickness at all points.

The thick-center-thin-edge design was probably the result of the influence of the distribution of material in those macadam pavements with which engineers were most familiar at the time the early concrete pavements were laid. Some of the first attempts at a mathematical analysis of the stresses created by wheel loads in the pavement slab treated the transverse section as a beam supported at the ends, and this type of analysis naturally indicated the need for a section which was thicker in the center than at the edges. The uncertainty of assumptions as to subgrade support tended to make engineers hesitant about accepting the suggested theories of design, with the result that a considerable amount of the concrete pavement laid was of a uniform thickness.

Upon the entry of the United States into the World War, the wheel loads on many of our main roads suddenly increased greatly, and instances of edge failure of thin-edge sections began to be reported. These edge failures frequently began with a corner break at a construction joint or transverse crack and often developed into a completely shattered area of considerable size. Many engineers began to suspect that the thick-center-thin-edge pavement was not properly designed.

On November 12, 1920, in Maricopa County, Arizona, construction was begun under a very extensive paving program, including some 130 miles of concrete pavement. The point of particular interest is that the cross section adopted for the entire project was 3 inches thicker at the edges than at the center, the edge thickening being gradually reduced to zero at a distance of 24 inches from the edge of the slab. The development of the thickened-edge design created widespread interest among highway engineers and, as the probable worth of the new design began to be appreciated, it was adopted for trial in a number of places.

The test road at Pittsburg, Calif., built during the summer of 1921, contained one section of the new design, and at the conclusion of the test this section was given the highest rating of all of those included in the track.

The sections of the Bates test road in Illinois laid in 1920 and 1921 contained no thickened-edge design but, fortunately, in the fall of 1922, sections of the new design were added and subjected to heavy traffic during 1923. The result was another early demonstration of the superiority of the new design over sections of uniform thickness when subjected to concentrations of heavy wheel loads. In this test the structural weakness of the edges of slabs of uniform thickness was definitely shown.

The Bureau of Public Roads at about this time developed a method for determining the stresses in concrete pavement slabs caused by wheel loads and, during 1923 and 1924, made a number of studies of stress. The data obtained from these tests indicated clearly the soundness of the thickened-edge design from a load-carrying standpoint.

The December, 1935, issue of *Public Roads*, published by the U. S. Bureau of Public Roads, contains a detailed study of concrete pavement cross sections by the Division of Tests and reported by L. W. Teller, Senior Engineer of Tests, and Earl C. Sutherland, Associate Highway Engineer.

Courtesy, Rockefeller Center Weekly and F. Wilkinson

"It's going to be a sweater for the boss!"

Future Public Works Must Be Planned Now

There is never time to prepare long range comprehensive plans in an emergency. Neither is such a period favorable to unhurried, thorough studies required for the preparation of such plans. The general staff does not devise its mobilization plans after war is declared.

We are to have more public works of an increasing variety in the future whether through PWA or other agencies. There is no use deceiving ourselves; industry at the 1929 rate or even higher production will not absorb all of the unemployed, not even the employables. British industry at 20 per cent above previous maximum production did not do it. Besides, we used to have quite a sizable volume of public works year after year before we ever had a PWA. It amounted to an annual average of about $2,400,000,000 for the years 1920-1930, including national, state, and municipal work.

Whatever may have been the justification for not planning during the emergency it would be inexcusable to permit the repetition of our present experience. It is to the credit of the PWA that it recognized the need for planning by the preparation of a "comprehensive program of public works" called for by the Act and established right at the start a National Planning Board to advise and assist the Administrator in the preparation of such a program "through the preparation, development and maintenance of comprehensive and coordinated plans for regional areas in cooperation with national, regional, state and local agencies."

Wise, intelligently prepared national, regional, state and local plans will permit more accurate appraisal of the relative value and urgency of single projects, the coordination of such projects, and the prevention of conflicts one with another; should insure greater long-term service values, and make possible the accomplishing of larger undertakings and a furtherance in the reconstruction of our national economy of broad social policies; will permit more systematic financial planning and programming, and be available to turn to in emergencies as well as in the regular carrying forward of public works; it should also prove a safeguard against "pork barrel" policies and an aid in fighting off political pressure. For these reasons and for the best adjustment with population characteristics and trends, public works in the future, to be of greatest social value and to make a maximum distribution of our national wealth and well-being, should be founded on carefully prepared, intelligent long-term plans of development of states and communities, integrated one with another and built on the framework of a broad national plan for producing from our wealth of natural resources an increasingly better life for all of us.

From a paper presented by L. Segoe, Planning Consultant, Cincinnati, Ohio, at the 1935 Public Works Congress.

Hand Labor, Machines Teamed on Bridge Job

List & Weatherly Co. Completed 1,650-Foot Concrete and Steel Bridge over Arkansas River

THE contract for the new concrete and steel highway bridge at Ralston, Okla., to replace the old inadequate steel truss structure which has carried State Highway 18 across the Arkansas River for so many years, was awarded to List & Weatherly Construction Co., of Kansas City, Mo., well-known railroad contractor and member of the Associated General Contractors of America, for $167,274.85. The structure consists of the south abutment at the Ralston end of the bridge, one land pier, three river piers, and four land piers and an abutment on the north side of the river. The spans from the south to the north side are one 100-foot, five 210-foot and three 100-foot.

The work order was effective February 4, 1935, and work actually started three days earlier. The first work was the excavation of Pier 1 at the south side and continued across the river working in the excavation of the south abutment as conditions permitted. The excavation bore out the preliminary borings at the pier foundation sites. All footings were carried 6 to 9 feet into rock, the excavation being through overburden of sand and gumbo from 5 to 45 feet thick.

Method of Excavation

The south abutment and Pier 1 were excavated by hand, and No. 2 by a Reliance 3-drum hoisting engine and stiff-leg with a Hayward clamshell bucket. This outfit was later used as a traveler for the erection of the steel superstructure. The remainder of the excavation was handled by a Koehring crane and ¾-yard Hayward bucket.

Jones & Laughlin steel sheet piling in 20 to 30-foot lengths and with a 16-inch web was driven by the Koehring crane carrying leads for a drop hammer. The driving was rather difficult in the sand and when the piling had been driven to refusal there was still considerable leakage from the sand strata. As soon as excavation started the water was kept down with a 3-inch Jaeger centrifugal and a 3-inch Rex pump.

Structural Dimensions

Six of the piers, Nos. 1 to 6, have 9-foot square bases 6 feet high with 6-foot diameter columns of variable height. The total height of Piers 1 to 6 varies from 44 feet to 49 feet 6 inches. The height of the base for these same six columns varies from 4 to 16 feet, the shafts from 25 feet 6 inches to 32 feet, and the webs from 23 feet 6 inches to 30 feet. The webs are 18 inches thick uniformly. Piers 7 and 8 are smaller because of the shorter spans to be supported.

Forms

Steel forms for the columns on the base were ¼-round and the shaft forms ½-round less the thickness of the web. Web forms were made up of wood in sections lined with 3-ply wood which minimized hand rubbing. These panels were 20 feet 10 inches wide and one-half the height of the web. They were made up of double 2 x 6's for wales and single 2 x 6's as stringers. The form lumber was 2 x 12 stock.

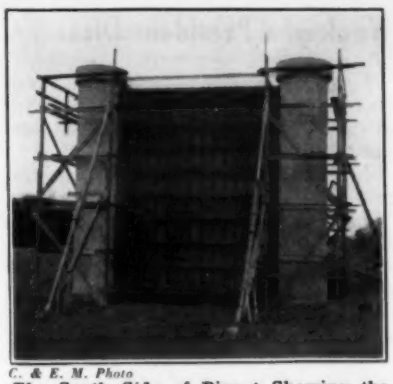
Aggregates—Concrete Pouring

A local aggregate producer furnished the sand by pumping from the bed of the Arkansas River. The crushed limestone for coarse aggregate was shipped in from Betts, Okla., by 4-yard center-dump trucks. These materials were stockpiled near the Jaeger 10-S mixer that produced all the concrete for the job.

There were two classes of concrete used, A and AA. The former is a 1 : 2 : 4 mix with 6 sacks of cement to the cubic yard, and the latter a 1 : 2 : 3 mix with 7 sacks of cement to the yard. The aggregates were loaded into wheelbarrows and weighed on a C. S. Johnson wheelbarrow scale and then pushed up a slight ramp to the mixer. The batches were all mixed 1½ minutes and then delivered to a truck which carried a 1-yard hopper with a gate. This was either poured directly into the forms from the truck running on a wood roadway or lifted by the crane and poured by "elephant trucks" into the deep shaft forms and webs.

A Fuller & Johnson 1-cylinder engine-driven pump furnished water for the mixer tank from a well dug in the river bed, pumping the water to a 6-foot diameter steel tank on a wood tower about 50 feet from the mixer.

The north abutment is carried on reinforced concrete piles which were fabricated by the contractor within 50 feet of the site. *(Continued on page 19)*



C. & E. M. Photo
The South Side of Pier 4 Showing the Sectional Plywood Web Forms in Place

Oil Tractors Operate on Low-Cost Fuel

Allis-Chalmers oil tractors, made by the Allis-Chalmers Mfg. Co., Milwaukee, Wis., employ a new improved system of engine operation by which diesel fuel is injected by a diesel pump into the combustion chamber and ignited with a spark. Operating under average price conditions, the A-C Model L-O oil tractor will burn diesel oil at approximately one-third the fuel cost of a similar sized gasoline burning tractor. In addition to using low-cost fuel, these tractors are claimed to save from 30 to 40 per cent on the amount of fuel consumed. The engine starts instantly with a push on the starter or a flip of the crank and for the first few revolutions, fires as a gasoline engine. Then it runs on diesel fuel. Gasoline is used only as a primer charge.

This tractor has a wide range of operating speeds, six forward and two reverse, and develops 79 drawbar hp.

Filler to Hold Water Gives Proper Slump Test

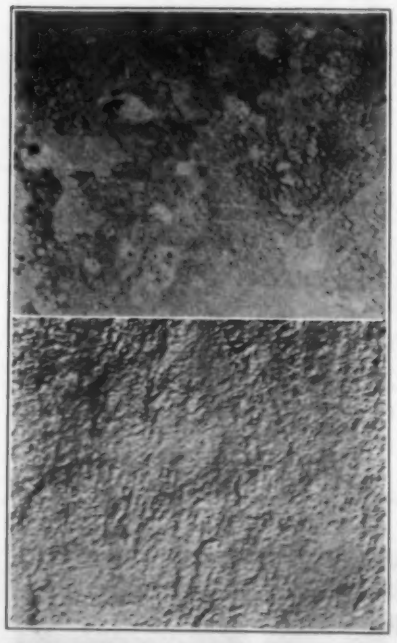
With the Federal specifications for paving concrete requiring a 2 to 3-inch slump, some batch designs have shown undesirable quantities of water on the surface of the slab. These have run off, leaving objectionable marks on super-elevated curves, and even on level tangents the tendency of the finishers to pull off all excess water has wasted an excessive amount of grout over the edge of the forms.

This very problem arose on Project NRS 779, an 18-foot, 9-6-9-inch slab 9 miles long on Texas State Highway 71 in Colorado County, for which H. B. Zachry of Laredo, Texas, was the contractor. Wishing to hold the surface water to a minimum the contractor sought every means to hold the water in the mix in order to secure the specified slump. Rock flour, a powdered limestone looking very much like cement, was tried and worked successfully but it cost about $5.30 a ton. Seventy pounds of the rock flour added to the batch of 1,439 pounds of sand and 2,446 pounds of gravel, dry loose weights, with 6 sacks of cement was the amount giving the best results.

Naturally the contractor wanted to use as inexpensive a material as could be secured to get the desired results. He searched locally and found that the river sand close by did just as well as the rock flour and cost only 30 cents a ton. Experimental sections were run under the supervision of the resident engineer for the State Highway Department and 70 pounds of rock flour, or 70 pounds of the river sand that analyzed 75 per cent passing a 100-mesh screen, or 35 pounds of each had the same effect in holding water in the slab.

Having purchased some quantity of the rock flour, the contractor wanted to use it up, so as long as the supply on hand lasted, he used 15 pounds of the rock flour and 60 pounds of the river sand in each batch. After that he used the river sand exclusively.

This experimental work was done under the direction of M. B. Hodges, Division Engineer, Division 13, Texas State Highway Department, and J. D. French, Concrete Paving Engineer for the State Highway Department. R. E. Schiller was Resident Engineer for the State Highway Department.



Above, Surface of Slab Showing Excess Water and "Springs" Through Which Uncombined Water Flowed From the Mix. Below, Pavement Surface After Mineral Filler Had Been Added to the Mix in the Paver.

Waukesha President Dies

Harry L. Horning, founder and President of the Waukesha Motor Co., died at the Battle Creek Sanitarium on January 4 after a long illness.

In April 1906, with local business associates, Mr. Horning organized the Waukesha company and became its Chief Engineer and General Manager. As the business grew from a mere handful to its present organization of 1,200 employees, he kept his close association with the details of the business and never ceased to be its general manager, in spite of his many other activities.

During the war he was Chairman of the Automotive Section of the War Industries Board and it was his Committee that produced the design for the Class B Liberty army truck.

Mr. Horning was a past president and life member of the Society of Automotive Engineers, a member of the Automotive Engineering Society of Great Britain, and the American Society for Testing Materials, a past president of the Motor & Equipment Manufacturers Association, the first president of the Internal Combustion Engine Institute, director of the Automotive Parts and Equipment Manufacturers Association, and a member of the American Petroleum Institute and the National Association of Manufacturers.

A Specialized Mower for Highway Shoulders

A specialized piece of mowing equipment designed to meet conditions on highway shoulders as well as in large parks has been developed by the Centaur Tractor Corp., Greenwich, Ohio. This mower is said to operate successfully on any slope which is not steep enough to cause side slip. The mower is designed wide so that it will side slip rather than tip over on grades. It is a front wheel drive unit with 34/6.50 tires mounted in front stabilizing the tractor

The Centaur Hi-Way Mower

in ditches and on slopes. It is equipped with a grinder and power belt for knife grinding together with two extra knives and a full set of repair equipment such as guards, rivets, knives, punches, etc.

The mower is operated by one man and carries a 6-gallon gasoline tank which is sufficient for one day's operation. The manufacturer offers to demonstrate the mower to state and county highway officials to show its ability to handle the grueling work of shoulder cutting.

Trucks and Tractors Fight Maine Snows

By LUCIUS D. BARROWS
Chief Engineer, Maine State Highway Commission

(Photo on page 44)

State Rents Equipment from Owners and Towns to Clear Roads as Part of Maintenance Program

SNOW removal, under definite legislative provisions, was first undertaken in the State of Maine during the winter of 1927-1928. The snow removal act provides for the removal of snow on town and city roads, and all classes of state roads which, in Maine, include state highways, state aid highways and third class roads.

The original act provided for state aid to towns and cities for snow removal on roads approved by the State Highway Commission upon petition for such approval by towns, and when the work was done by the towns in accordance with requirements established by the Commission. This general plan has been carried on since 1928 except that in 1935 the Legislature made a change in the manner of handling snow removal on the state highway system.

Approved snow removal routes in 1927-1928 included 3,075 miles. Since 1928 new approved routes have been added until last winter (1934-1935) the program of snow removal included 11,800 miles.

The Legislature, in 1935, provided that snow shall be removed from such sections of designated state highways as the State Highway Commission may determine, and under the direction and control of the Commission. As to state highways, the law, as amended, considers snow removal as a part of highway maintenance rather than as a separate activity.

For summer and winter maintenance on the state highway system, towns pay to the State $100 per mile for each mile of improved state highway, except if the Commission deems it inadvisable to remove snow on any section of state highway, the payment by the town is reduced to $60 per mile. The State pays the balance of the maintenance cost.

Under the snow removal act as amended in 1935, the old provisions are continued for snow removal on state aid roads, third class roads and town roads. Towns must submit to the Commission petitions for approval of snow removal routes, and on approved routes the work of snow removal is prosecuted by the towns under supervision of the Commission. Towns may carry on the work with their own equipment or may have it done under contracts approved by the Commission.

On these secondary roads towns pay for the work and are reimbursed by the State for one-half the cost up to a maximum payment by the State of $50 per mile, except in plantations and unincorporated townships payment by the municipality is limited to $35 per mile.

Snow Removal on 12,000 Miles

The snow removal program for the present winter includes approximately 12,000 miles of highway, of which 2,322 miles are included in the state highway system; the balance, 9,678 miles, includes state aid roads, third class roads and town roads.

Of the 2,322 miles of state highway, the Commisson has arranged for snow removal on 1,469 miles by contract; arrangements have been made for rental of privately-owned equipment on an hourly basis on 180 miles; town-owned equipment has been rented on an hourly basis for 457 miles; and 216 miles will be kept open with state-owned equipment. Sanding on the state highway system is done by the regular maintenance patrolman.

Snow removal on other than state highways is handled by the towns under supervision of the State Department. The work is done by contract or by the hour and in many cases with equipment owned by the towns and cities.

Rental rates for equipment are established by the Commission on all snow removal work which is done on an hourly basis. The rates are as follows and include operator, gas, oil and grease:

Tractors

2½ Ton	$3.25
3 Ton	3.50
4 Ton	3.75
5 Ton	4.00
6 Ton	4.50
7 Ton	5.00
7½ Ton	5.25
8 Ton	5.50
9 Ton	6.00
10 Ton	6.25

(Continued on page 27)

A Well-Plowed Highway in Maine

States must make provision, as early as possible, for all highway developments that can be foreseen through forecasts of population and industry, by acquiring rights-of-way of ample and generous proportions with suitable provision for roadside improvement and use any excess width acquired for landscaping until it is needed for traffic use.
—M. W. Torkelson, Director of Regional Planning, Wisconsin State Planning Board.

Paving County Road on Texas Black Land

A 20-Foot Concrete Road 2.07 Miles Long Was Part of Harris County PWA Project

THE Harris County, Texas, public works program has proved its value in absorbing unemployed labor. Unskilled workers are still available for highway work in fair numbers, in spite of generally improved conditions in south Texas. But skilled labor could not be furnished in sufficient numbers for this project by the Harris County Reemployment Office, so the contractor was permitted to seek skilled operators wherever available.

Project PWC 1312 A3 in Harris County, Texas, was 2.07 miles in length with a 20-foot concrete slab 9-6-9 inches in cross section. The expansion joints were placed every 78.6 feet average with two dummy joints in each slab. The concrete was designed for 5 sacks of cement to the cubic yard and 6½ gallons of water per sack for a slump of 2 to 3 inches. The entire project was within what might be called city construction limits and all of it was over the Texas black soil which dries like buckshot. The work was replete with many bridge approaches and curves with widened sections. A 12-foot floating slab was used at either end of all bridges resting on a sill 14 inches deep, dowelled and 8 inches wide.

River Gravel and Sand

The coarse aggregate, gravel, was delivered by rail from the Colorado River at Eagle Lake, Texas, about 80 miles distant. San Jacinto River sand was brought 15 miles by barge to Houston and transferred to gondola cars for delivery.

All aggregates were unloaded by a Byers Master crane with a 40-foot boom and a 1-yard clamshell bucket. The Heltzel batcher was equipped with a large Kron dial scale, giving easy visibility in determining the weights. The batches were designed with 1,500 pounds of sand, 2,560 pounds of gravel, both loose dry weights, and 6 bags of cement to the batch. Four men operated the batching plant per shift, a foreman, crane man, batcher man and laborer in the cars.

The cement cars were spotted about 300 feet from the aggregate cars on the same spur. Three men in the car handled the bags. The first tossed the six bags onto the one-batch trucks which already had their aggregates, the next man emptied the bags and the third covered the entire batch with a burlap top rolled on a pole.

Grading and Form Setting

The rough grading was all attended to by three to six fresnos and teams. A Carr Formgrader cut the trenches for the forms and the same operator went back and ran the McCormick-Deering-powered 5-ton roller equipped with a scarifier so that it could be used to lower the rough grade if found too high.

The Blaw-Knox steel forms were set by a form-setter and two helpers who were followed up by a foreman and two men to line up the forms. A Caterpillar Thirty pulling a Koehring planer and a Lakewood subgrader ahead on the forms cut the grade to within ½ inch of the final elevation. The excess dirt was windrowed by an Edwards grader with an 8-foot blade and hand-shoveled outside the forms by the ten men on the final grade crew who checked the grade with a scratch board. Because of the nature of the soil it was necessary to wet down the grade continuously to permit the rolling to compact the material successfully. Sand was hand-cast over the grade to fill the inequalities and give a smooth firm grade.

(Continued on page 17)

C. & E. M. Photo

Pouring and Finishing a Widened Curve in Harris County, Texas

Keeping Roads Safe for Winter Traffic

On account of the Niagara escarpment running through the county of Lincoln, Ontario, there are a large number of long and comparatively steep hills which, in weather that is alternately freezing and thawing, require daily supervision as to sanding. The organization for ice conditions must be very mobile or else be located at each individual hill ready for action should dangerous conditions develop suddenly.

The main organization, as described by F. W. Weir, Engineer of Lincoln County, in the January issue of *Engineering and Contract Record*, is centrally located and equipped with trucks, stone chips and calcium chloride. Stockpiles of stone and calcium chloride are also ready mixed at strategic points. This organization of two trucks and four or five men is ready to go out as soon as danger develops. Often it can anticipate a dangerous condition and take care of it before it arises. The stone chips are spread by hand from the rear of the truck.

On some hills sand barrels are placed 100 to 150 feet apart and a man living close at hand spreads the sand from these barrels when conditions require it. Calcium chloride or salt is mixed with the sand at the rate of about 35 pounds to the cubic yard. The same amount is used with the stone chips.

Approaches to railway crossings and sharp curves, particularly fertile spots for accidents, are taken care of by the truck gangs.

There are other ways of making roads safer in winter, such as building wider shoulders and flatter ditches, cutting brush and weeds and eliminating objects which collect snow. A helpful measure for narrow culverts and bridges is to erect black and white markers at the four corners as a guide to drivers as well as snow plow operators. Adequate guard rails at dangerous spots along deep ditches and sharp turns are also useful, and building up the edges of the road so that the road has no excessive crown is desirable, as sharply crowned roads are slippery in frosty winter weather.

Road building and maintenance is the public's business, first, last and always. The public must pay for its highways, regardless of whether it builds them during periods of depression, periods of prosperity, or whether it pursues the best policy of all and conducts continuous, adequate highway construction each year under a long-time, well-planned program.—Charles M. Upham.

New Light-Weight Shovel With 3/8-Yard Capacity

A new 3/8-yard shovel light enough to be transported on a heavy-duty truck was exhibited by the Byers Machine Co., Ravenna, Ohio, at the Road Show in Cleveland last month. This Bear Cat Junior attains its light weight through a balance of machinery to eliminate all dead counterweight and a freedom from crawler mechanism beneath the machinery deck.

All operations of traveling, steering from both crawlers, swinging, independent crowding and hoisting are accomplished through only three operating shaft assemblies on the fully-enclosed machinery deck. The travel shaft is located on the machinery deck; there are no shafts below the main frame. A three-speed transmission between the motor and take-off gear provides three travel speeds and two operating speeds, for ordinary light digging. The gear-driven swinger can be positively locked to prevent swinging while traveling. All machinery is protected by an automobile-type of hood enclosure. The motor hood can be locked to prevent theft of gasoline and accessories.

The motor is a 4-cylinder slow-speed industrial type, developing 30 hp. The manufacturer states that it uses only 10 gallons of gasoline a day in steady digging.

Hanna General Sales Mgr. for Union Metal Mfg. Co.

Early in January, 1936, D. B. Hanna became General Sales Manager of the Union Metal Mfg. Co., with headquarters at Canton, Ohio. Mr. Hanna is in charge of sales activities and sales personnel, and will continue also as an officer of the American Concrete Corp. W. A. Porterfield, as Vice President of the Company, is in charge of Sales Promotion and special sales assignments. The Union Metal Mfg. Co. is well known as maker of metal lamp standards and fluted steel pile shells.

Vice President Retires from American Hoist & Derrick

The American Hoist & Derrick Co., of St. Paul, Minn., has announced the retirement from active service of Howard S. Johnson, Vice President of the company for a period of years. Mr. Johnson's place on the Board of Directors has been filled by Rolf E. Ljungkull, Chief Engineer of the company.

It is not the primary purpose of the WPA to build roads or streets or similar projects. To the extent that road and street construction projects come within the requirements laid down to qualify all projects, they are acceptable. Rural roads that lie outside the Federal-Aid system and outside the state highway system are popularly known as farm-to-market roads and since these quite often meet the requirements of the program, a large proportion of personnel outside the metropolitan centers have been assigned to such projects.—Perry A. Fellows, Asst. Chief Engineer, Work Progress Administration.

Roads of the Future in South America

Stimulated by Plan for Pan-American Highway and Improved Finances So. American Republics Plan for Better Roads

(Photos on page 44)

THE first suggestion for a Pan-American Highway, to make possible travel by motor car the length of the Americas, was made at the Fifth International Conference of American States in 1923. Progress on the Inter-American Highway, from the U. S.-Mexico border to Panama, was discussed in the article of this series on roads of the world in our January issue. While less definite progress has been made in South America as a whole, individual countries are realizing more and more the necessity for roads to develop the vast territories still unopened in the continent to the south of us, as well as to increase friendly and cooperative intercommunication between the South American states.

In spite of the vastness of the enterprise and the economic difficulties of the past few years which for many of these countries are still existent, the dream of a system of roads connecting the states of South America may not be so long in realization after all. Long sections have already been built and several of the governments report that they have definite plans for continuing work "as rapidly as the national resources permit," according to an article on the Pan-American Highway by E. W. James, Chief, Division of Highway Transport, U. S. Bureau of Public Roads, in the May 1935 Bulletin of the Pan American Union.

Route of Proposed Road

The project presents interesting and difficult problems. The entrance into South America from Panama presents the first difficulty, as there is no record that any white man has ever traveled overland between the Republic of Panama and Colombia. It is possible that this part of the route for the time being will have to be avoided by means of a ferry from Cristobal to a port in Colombia or even to La Guaira, Venezuela.

In Colombia, the road would extend from the port selected for the ferry terminal to Bogotá, the capital, and thence to the Ecuadorian border, much of which is now a well-built gravel road. From Tulcán near the border in Ecuador, the national highway extends south as far as Riobamba and would be a part of the Pan-American Highway. Plans have been made for the extension of this road to the Peruvian border although whether this or an alternate route south from Quito would be the official highway has yet to be decided. A route along the Andes would probably extend south through Loja, Ecuador, through Peru to Puno on Lake Titicaco, between Peru and Bolivia, where it would connect with a road to the coast. From Puno a route is proposed through La Paz, Cochabamba to Corumba, Bolivia, and thence to Rio de Janeiro. Another route would extend by way of Sucre, through the Paraguay Valley to Rosario and Buenos Aires, Argentine.

The line down the Chilean coast, if it goes no farther than Valparaiso, would turn again toward the Andes and cross by way of Santiago de Chile to Mendoza in Argentine. A road now exists between these two points but like the railroad line in the same general region, it is closed to traffic many months by snow.

The total mileage from Panama to Buenos Aires on the shortest combination of routes is approximately 6,500 miles and the total of all alternates is no less than 16,500 miles. The field work of reconnaissance, while uniformly difficult, will present no unusual requirements of organization except between Panama and the Atrato River Valley in Colombia and between Santa Cruz de la Sierra in Bolivia and the region to the west of Rio. For these sections, parties will have to be organized practically on a basis for exploration.

Argentine

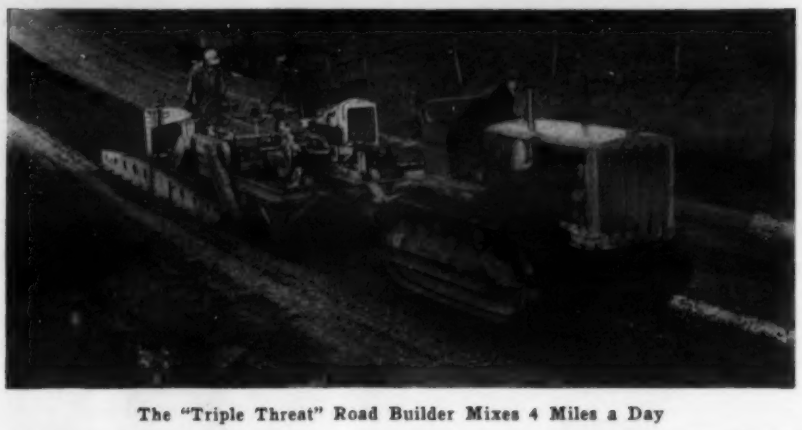
With internal business booming in Argentine, her road building program is going ahead rapidly. During 1933-34 and the first two months of 1935, Argentine constructed approximately 176 miles of hard-surfaced roads, 134 miles of improved dirt roads and 1,265 miles of ordinary dirt roads, or a total of 1,575 miles of highways, at a cost of about $6,500,000.

Highway construction now under way or approved consists of 3,402 miles of ordinary dirt roads, 647 miles of improved dirt roads, and 761 miles of hard-surfaced roads, estimated to cost about $22,300,000.

The work of the National Highway Board is being carried on under the authority of two national laws. One provides money for the construction of roads through a 3 per cent tax on the net profits of the railways while the other authorized the creation of a system of trunk roads throughout the Republic, money for which is secured by a tax on gasoline and lubricating oils.

Work in project or anticipation in May 1935 included the following appro-

(Continued on page 22)



The "Triple Threat" Road Builder Mixes 4 Miles a Day

A Mix-In-Place Machine With Powered Pug Mills

A "triple-threat" machine, designed to build better mixed-in-place bituminous retread or stabilized roads of salt, chloride or bituminous material with clay binder, was exhibited at the A.R.B.A. Road Show by the Jaeger Machine Co., 701 Dublin Ave., Columbus, Ohio. This Triple Pug Mill road builder has three pug mills, driven at 70 to 80 rpm by a 55-hp engine, through which all material is passed before reaching the final screeds. This produces a more thorough and uniform mix, in one pass, than is obtainable with seven to ten passes of ordinary bladers, according to the manufacturer's statement. On more than 100 miles of test roads built with this machine, surfaces with density and weights of 140 to 150 pounds were reported by the engineers in charge, indicating the opportunity this machine offers for producing longer life surfaces with low-cost materials properly mixed.

In addition to the high production, up to 4 miles a day, and the savings resulting from one-pass mixing and finishing, the machine can use quick-curing bituminous cements which permits immediate opening of roads to fast motor travel without pick-up of materials. Plow blades in front and control gates in the rear which direct the material to either side of the traction wheels and control the flow as desired also assist in mixing. Oil jets may be attached to the machine for applying a tack coat.

A smooth surface is insured by 21-foot long straight-edge runners which carry the finishing screed and float independent of the ups and downs of the pug mill mixing unit, the weight of which is carried on three Timken roller bearing dual rubber-tired wheels. The machine lays 10-foot lanes, is adjustable for crown and adapted for blending joints in two-lane work. The front wheel, of the caster type, swivels 360 degrees, permitting turning the machine in its own length and the unit is easily raised for maneuvering freely on its wheels.

New Welded Snow Plow

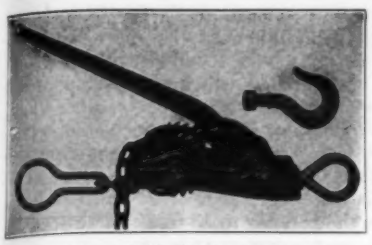
A new snow plow, designed particularly for use with the Warco Model 35 motor grader, has recently been announced by the W. A. Riddell Co., Bucyrus, Ohio. This snow plow is of welded construction, is heavier and wider than any of this company's previous models and is designed for heavier duty.

One of the features of this plow is the removable blades. The plow lifts with the same mechanism as the scarifier and can be attached or detached without affecting the scarifier. The wings are so concaved and given the proper angle that the snow is delivered to the side of the road.

Complete information and an illustration of this new plow can be secured by readers of this magazine direct from the W. A. Riddell Co.

A New Tractor Grader

A grader weighing only 3,575 pounds, carrying an 8-foot blade and designed particularly for tractor haulage, has been announced by Caterpillar Tractor Co., Peoria, Ill. This is said to be the only grader below the 5,000-pound class built for tractor haulage. Its features include welded box-frame construction, an adjustable tractor pole, leaning wheels and an extensible lift link for extreme blade positions. It is adaptable for construction, ditching and maintenance work. This No. 22 grader is built to match tractors between 20 and 35 horsepower and is expected to serve the roadways of townships and smaller cities particularly.



The ACCO Utility Jack

New Stretcher and Puller for Cables and Fencing

A utility tool suitable for many applications involving stretching, pulling, binding or lifting has been announced by the Welded Chain Division, American Chain Co., Inc., Bridgeport, Conn. The complete device includes the frame with operating parts, a 10-foot stretcher chain and a 5-foot anchor chain. It is capable of handling loads up to 4,000 pounds.

When in use the stretcher chain fits over teeth in the sprocket wheel and power is supplied by raising and lowering the handle. The axle of the handle being eccentric, it transmits power through two pawls engaged in the wheel. One pawl is always in position, therefore, the wheel cannot slip. This Acco jack, without chains, weighs 34 pounds.

Small Crane Clears Land for Miss. Dam No. 6

A new means of fast and economical land clearing has been devised by the Nevada Construction Co., operating near Fountain City, Wis., where they are stripping 6,000 acres of trees for the reservoir to be created by Mississippi Dam No. 6, now under construction in the Federal flood control plan.

A small P & H Bantam-Weight crane weighing less than 15,000 pounds and with a 25-foot welded tube boom, is used in handling and piling logs and brush in proper shape for burning. Logs 4-foot on the stump, 20 feet long, 28 inches on the top and weighing 5,500 pounds, were handled with ease at 20-foot radius.

Iron Paving on Exhibit at A.R.B.A. Road Show

One of the new developments exhibited at the Road Show was the Tri-Pedal unit system of iron paving, introduced by the Interlake Iron Co., 332 So. Michigan Ave., Chicago, Ill. This system embodies the fundamental principle of three-point support in each iron unit forming the paving to provide rigidity. This type of paving is formed of 10½-inch triangular iron tiles, 1⅜-inch thick, which are easily and quickly laid, and as readily taken up and relaid without damage, facilitating underground renewals and repairs. The tread design of the tiles provides an anti-skid surface for all kinds of traffic and sure footing for pedestrians in all weather.

The manufacturer claims for this type of paving the feature of permanence, as evidenced by municipal castings which remain undamaged by traffic while the surrounding materials disintegrate; that tire suction, a major source of noise, is eliminated; and that water and slush drain off more readily than from standard types of roads.

Complete details and specifications for this type of paving may be secured by readers of this magazine direct from the Interlake Iron Co.

Modern Traffic Line Marker

The Littleford Traf-O-Spray, made by Littleford Bros., 485 E. Pearl St., Cincinnati, Ohio, is claimed by the manufacturer to be more than a line-marking machine. It not only puts down a clean-cut uniform traffic line on brick, block, broomed or smooth concrete, asphalt or any other type of hard surface, but also may be used for painting guard rails, bridges, airway direction signs, equipment or for any type of painting job.

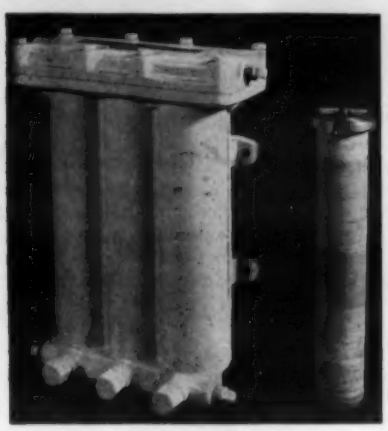
The outfit consists of a combination motor and compressor, a DeVilbiss spray gun and paint reservoir mounted compactly on a running gear having three pneumatic-tired wheels. It is short coupled and the spray head is centered so that sharp curves can be marked.

The paint is sprayed onto the road by means of a regular trigger type gun, which can be detached in 10 seconds and used for any other type of painting job. Separate air regulators provide proper pressure on the paint supply and on the air nozzles. This regulation allows adjustments to suit the operator's walking speed and type of paint used.

Literature describing and illustrating the Traf-O-Spray may be secured by interested state and county highway engineers and contractors direct from Littleford Bros.

New Appointments in Steel Co.

The Carnegie-Illinois Steel Corp., Pittsburgh, Pa., has announced the appointment, effective Jan. 1, 1936, of C. R. Moffatt as Advertising Manager and of G. Reed Schreiner as Assistant Advertising Manager. Their offices will be in the Carnegie Building, Pittsburgh.



A Skinner Diesel Oil Filter and a Separate Filter Pack

A New Engine Filter for Diesel Fuel Oils

A diesel fuel oil filter employing the principle of edge filtration has been announced by Skinner Purifiers, Inc., Detroit, Mich. The manufacturer claims positive removal of all contaminants in the oil, insuring pure fuel oil and constant freedom from wear of the injector pump parts; no frequent inspection or replacement of the filtering element; and provision for cleaning the filter while the engine is in operation as well as full automatic operation.

The fuel transfer pump discharge is connected to the lower header delivering oil at the required pressure into the filter shell where it passes between, not through, hundreds of specially prepared paper discs, which compose the elements or filter packs. The oil passes into a central hole of each pack, and is discharged into the filter head which is connected through the discharge line to the injector pump. The impurities collect at the surface of the packs, as the maximum space between the discs composing the packs is less than 1/250,000th of an inch. Operation of the filter continues indefinitely until the percentage of impurities removed from the oil offers such resistance to normal flow as to retard the capacity of the filter. Then it is cleaned.

This is accomplished by opening, in turn, each of the three nuts on the bottom header. As the nut is partially unscrewed, the discharge from the transfer pump to that particular chamber is temporarily cut out of service, while the other two continue in operation. At the same time, the reverse pressure of oil in the filter head discharges clean oil back through the inside of the packs, washing the impurities from the surface. The cleaning operation requires only a few ounces of oil to remove all the solid impurities. The filter is then ready for service again without having stopped the engine.

When furnished for diesel engines now in service, the filter is ready to connect to the present lines to the injector, and is supplied with supporting lugs cast integral with the filter shell. The approximate dimensions are: 6⅜ inches wide, 11¾ inches high, and 2¼ inches from front to back.

Kinney Moves Office for Southwest District

The Kinney Manufacturing Co. of Boston, Mass., has closed its office in the Finance Bldg., Kansas City, Mo., transferring its activities to 710 Santa Fe Bldg., Dallas, Texas. This office, like the former Kansas City office, is under the management of H. G. Saunders who has charge of Kinney sales for distributors, pumps and clutches for the states of Louisiana, Texas, Arkansas, Oklahoma, Missouri, Kansas, Colorado, Nebraska and New Mexico.

A New Roll Crusher for Portable Plants

A new roller bearing roll crusher, 30 x 18-inch, was exhibited by the Iowa Manufacturing Co., Cedar Rapids, Iowa at the Road Show. This medium size crusher, designed for use in a two-unit portable plant, has a number of features, among them chrome nickel S.A.E. 3140 roll shafts; eight heavy-duty Timken bearings; Shafer self-aligning countershaft bearings; Timken bearing seals, inside next to the bearings protected with Garlock Klozure type which are protected further with triple groove labrinth seals on the exposed sides to keep the grease in and the dirt out; compression springs of two-chrome vanadium steel; large 2¼-inch diameter adjusting screws; smooth shells for ¾-inch material and finer; beaded shells for larger material; and sectional roll shells in four segments which are easily replaced without taking the entire crusher apart.

This unit is 3 feet 4 inches in height, 5 feet 3 inches wide, weighs complete 11,000 pounds and has a capacity of 90 to 130 cubic yards of 2½-inch material an hour down to 18 to 27 cubic yards of ¼-inch material an hour.

Wills Creek Dam Diversion Channel in Deep Rock Cut

(Photo on page 44)

Difficult Excavation, Construction Bridge, and Heavy Hauling Feature E. J. Eiff Job

WILLS Creek Dam, the farthest downstream of the present chain of flood control structures in the Muskingum Conservancy Project, is located near Dresden and Conesville, Ohio, on Wills Creek which is a direct tributary to the Muskingum River. The Wills Creek Dam is an earth embankment 1,950 feet long and 60 feet high, partly on a pervious and partly on an impervious foundation. It is to have a side channel spillway and two outlet conduits controlled by six 7 x 15-foot gates. The drainage area above the dam is 844 square miles and the dam will create 6,000 acre-feet of conservancy storage and 190,000 acre-feet of flood storage.

The contract for the construction of this dam was awarded to Edward J. Eiff of Quincy, Ill., on January 22, 1935, for $628,007.50. The work includes 540,000 cubic yards of common excavation, and 152,000 cubic yards of rock excavation. There will be 555,000 cubic yards of embankment and 25,500 cubic yards of concrete in the spillway structure. The embankment is spread in 6-inch loose layers and compacted with sheepsfoot rollers, being wet by sprinkling to give the optimum moisture content for rolling to maximum density. The slopes of the faces of the dam are 1072 to 1073½ upstream and the same downstream.

Work on Diversion Channel

The cut at the site of the diversion channel for this dam was 65 feet deep of which the lower 50 feet was rock. The rock was taken out in two 15-foot lifts and the remainder as one cut. Two Ingersoll-Rand wagon drills handling 10, 16, and 20-foot steel with 1¼-inch I-R detachable bits were used for the major drilling operations. A Gardner-Denver No. 35 jackhammer and a pavement breaker of the same make were used, the latter for shaping up and on soft stone. Two Gardner-Denver 315-foot air compressors supplied power for the pneumatic equipment.

The holes were shot with 40 and 60 per cent ammonia dynamite supplied by the Austin Powder Co. and exploded with an Austin battery.

Loading Out Rock and Earth

The contractor used two Link-Belt machines for the major excavation operations. One was rigged as a shovel with a 2½-yard Amsco bucket for rock work and was powered with a 135-hp Climax engine. The other rigged as a dragline had the same power plant and was equipped with either a 50 or 75-foot boom as the work required.

In the diversion channel cut early in the work the working conditions were particularly bad. The cut was constantly filled with water from rains and the natural drainage was poor, necessitating constant pumping with a 4-inch Jaeger centrifugal. The ground-up rock, chewed into a fine dust by the crawlers hauling through it in the water, made a slurry that choked the pump many times. The muck also choked the drainage channel for the gravity flow of the water out of the cut and from time to time a tractor and bulldozer was sent in to move large quantities of it to the sides where it had a chance to dry out.

The floor of the channel during excavation was rough and full of holes which were covered with water and muck so that the crawler wagons and tractors were frequently at odd angles with each other. No untoward delays nor accidents occurred because of this condition.

The hauling equipment consisted of nine Athey 12-yard Forged-Trak wagons with Caterpillar Seventy-Five diesels for hauling. Normally, or should we say, "when going was good," two wagons were hauled by each of the Seventy-Fives, on moving earth. On rock work because of the condition of the surface it was only possible to use a single wagon for each tractor and the same was true on hauling dirt when stripping the rock in the diversion channel.

On the stripping there were many slides so that it was inadvisable to use the wagons to load directly with the dragline and 3-yard Page bucket. During this time the earth was cast to a stockpile and later reloaded to the wagons and hauled to the embankment. Both the shovel and the dragline were equipped with two headlights permitting night operation. This was necessary as the job was run 20 hours out of the 24.

Construction Bridge

As Wills Creek cut the site in two it was necessary to build a heavy construction bridge for the hauling of the rock excavation, the earth stripped from the rock, and the materials for the filling of the toe trench. This bridge was built on heavy timber abutments with four 36-inch I-beams each 80 feet long and planked with 4-inch oak and covered with 6 inches of dirt. It withstood the vibration and heavy loads admirably. During periods when there was considerable moisture the crawlers squeezed the earth cover to the sides and center, making the negotiation of the bridge by automobile a rather hazardous stunt. Occasionally a bulldozer was run over the structure to smooth the surface earth and prevent tying up the job by a "hung" motor car.

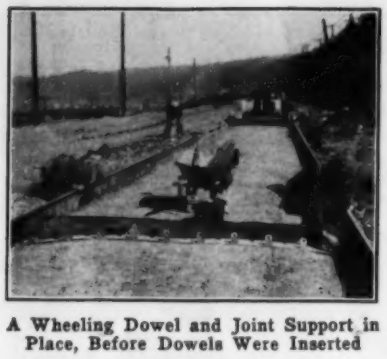
C. & E. M. Photo

Dumping Rock in the Toe Trench

Embankment

The embankment was spread in the

(Continued on page 29)



A Wheeling Dowel and Joint Support in Place, Before Dowels Were Inserted

Flexible Metal Supports Now Made for Dowel Bars

Intended to overcome the many difficulties of properly supporting dowel bars at transverse expansion and contraction joints in concrete roads during construction, the Wheeling dowel and joint support has been announced by the Wheeling Corrugating Co., Wheeling, West Va. The support is a single piece of sheet steel 18 inches wide and the same length as the joint. One inch from each edge of the base plate, and spaced according to state specifications, lugs are punched and bent upward. These lugs have holes of the proper size to hold the specified dowel bar and the lugs are of the correct height to support the bars the proper distance from the subgrade or the finished surface of the pavement. Along the center of the base plate, at regular intervals, are punched lugs to support the premolded expansion joint. These center lugs are not necessary when the support is used only to hold dowels at contraction joints. This device is made of sufficiently flexible steel so that it conforms to the subgrades of thickened edge pavements as well as of uniform crowns.

The supports are shipped nested in crates, and in order to permit nesting, the lugs when shipped are slightly off the perpendicular, but can be bent readily without tools to the straightened position. The standard crate of supports contains five pieces, and if the joint is 10 feet long, the 50 linear feet of joint in the crate weighs approximately 125 pounds. The weight of the support itself is 2.3 pounds per linear foot.

Literature on these supports, which were exhibited at the Road Show, may be secured from the manufacturer.

Koehring Co. Announces New Dealer Appointments

Koehring Co., of Milwaukee, Wis., has recently announced several appointments of new distributors for the sale of its products, including shovels, cranes, draglines, pavers, mixers, Mud-Jacks and Dumptors.

Howard W. Read Corp., located at 800 North Delaware Ave., Philadelphia, Pa., will handle the eastern Pennsylvania territory; the Dalrymple Equipment Co., of Amory, Miss., will handle the northern section of Mississippi; Massachusetts, with the exception of a few western counties, Vermont, Maine and New Hampshire, have been assigned to the Parker, Danner Co., 4 Northampton St., Boston, Mass.

Processed Rock Asphalt and Artificial Mixtures

The term "rock asphalt" is one that has been applied for many years to a natural rock whose particles are coated with asphalt by nature. It occurs in two general classes, one having as its base aggregate sandstone, and the other limestone. There are deposits, however, containing a mixture of sandstone and limestone. The natural rock, coated with natural asphalt, makes a paving material quite different from any artificial mixtures. Even though there may be insufficient asphalt in the natural rock to bind the particles in a pavement, the natural coating of the mineral aggregate with asphalt makes it easy to coat the aggregate grains with additional asphalt because of the natural priming of the grains.

When additional asphalt is used with the already primed rock, whether of sandstone or limestone formation, the term "processed rock asphalt" is usually applied to the mixture. This processed rock asphalt only departs from the natural material in proportion to the amount of manufactured asphalt used. Inasmuch as this is usually very small, the processed material frequently differs very little from the natural product.

A. H. Hinkle, Director, Kentucky Rock Asphalt Institute, Louisville, Ky., states, "The superior merits of rock asphalt, generally recognized now by most highway engineers throughout the country, are being capitalized on by certain unethical manufacturers in applying the term to other purely artificial mixtures. Thus, new highway officials, inexperienced in road materials, are misled by the use of the term 'rock asphalt.' It is believed that this practice of applying the term rock asphalt to these artificial mixtures should be frowned upon, as it is generally only intended to deceive the unsuspecting public and inexperienced official, and can serve no good purpose.

"The fact that some modifying term is attached to the term 'rock asphalt,' frequently a copyrighted term applying to a patented mixture, is still further reason for discouraging the use of the term 'rock asphalt' in connection with purely artificial mixtures."

New Catalog on Batteries for Trucks and Busses

A new 16-page supplement to its salesmen's catalogs on "Batteries for Trucks and Busses, 1935-1936" has recently been issued by The B. F. Goodrich Co., Akron, Ohio, and is available to individual or fleet operators of trucks and busses upon request to the manufacturer. Part of the book is devoted to a discussion of operating requirements of truck and bus batteries and a description of Goodrich construction features. A page is given to truck and bus battery specifications and three pages to an exposition of the battery power requirements for trucks and busses plus additional pages devoted to other pertinent data.

Paving County Road in Southeast Texas

(Continued from page 8)

Producing the Slab

On standard 20-foot tangents the paver ran on the shoulder but on widened curves it ran within the forms. This necessitated a change in method of handling the steel which could not be placed ahead of the paver when it ran inside the forms. Welded bar mats, fabricated by the contractor, were used. Some difficulty was experienced with the cross section being reduced at the point of welding but this deficiency in strength was corrected by using an extra bar in each mat. Single marginal or side bars were used supported temporarily by stirrups held by the forms. There were four men on steel, two carrying in the welded mats and two others setting the center steel and marginal bars.

The 1-inch expansion joints carried 20 dowels, ⅜-inch round and 2 feet long, dipped in asphalt and rolled in sand to coat them for easy handling. The dowels were wired to transverse reinforcing bars at either end and were capped with metal sleeves on the end toward the paver.

Water for the Smith 27-E paver was secured from the Houston water mains through a 3-inch Trident Crest meter delivering to 6,000 feet of 2½-inch water line and 4,000 feet of 2-inch pipe. The gate valves for the paver hose were set every 300 feet and the paver carried 200 feet of hose which was kept from damage by a man who also oiled the forms.

The paver operator carefully spotted the batches and spread them to minimize the shoveling of the four men who puddled and spaded the sides.

Finishing Operations Varied

The contractor did not elect to use his Lakewood finishing machine on the widened curves but used hand labor instead to screed and finish the slab. A 14-foot longitudinal float was used by two huskies to compact the concrete after it had been struck off by an angle iron screed pulled by the paver. This iron strike-off had a pair of plow handles at the end so that it could be operated more effectively. The men handling the float used to compact the concrete walked in the concrete which showed distinctly the effect of their work. The head man walked in concrete which had simply been shoveled into place and consequently sank into the material. The rear man walked on the concrete which has been tamped by the float and he sank in only about one-half as much, about 3 inches. These foot marks had to be worked out by the finishers.

On tangents a Lakewood finishing machine handled the strike-off and screeding, followed by two bull-float men with a 14-foot float worked from twin rolling bridges. Following the longitudinal float the finishers used Heltzel 10-foot drag straight-edges, long-handled floats, and then a 10-inch canvas belt held taut by an arch of thin boards. A third finisher took care of the expansion joints.

For curing, burlap was placed by two men immediately after the finishing was complete. This was removed after 10 the following morning and the slab covered with earth and kept saturated for 10 days.

Personnel

The original contract was awarded to the C. E. Barnett Construction Co., of Houston, Texas, but it was later assigned to F. H. Berry who completed the work. A. C. Moore was Superintendent for Mr. Berry. The work was done under the direction of C. R. Haile, County Engineer of Harris County, with C. L. Tindall as Project Engineer for the County.

Laying R. C. Sewer Pipe in Columbus, Ohio

(Continued from page 1)

Byers crane and lowered to the bottom of the trench for pouring.

Personnel

The work of the Kalill Co., of Cleveland, Ohio, contractor for this section, was in charge of Chick Elias as Superintendent. For the city of Columbus the work was under general supervision of the Division of Engineering and Construction, of which P. W. Maetzel is Chief Engineer, with O. Bonney, Sewerage Relief Engineer in charge of the design and construction of sewers, D. T. Mitchell, Chief Field Engineer in charge of construction and A. M. Mock, Engineer in charge of this section. John H. Gregory is Consulting Engineer for the City. The PWA is represented by L. A. Boulay, State Engineer, and J. B. de Hamel, State Engineer Inspector.

McGraw Heads Promotion of A-C Tractor Division

Allis-Chalmers Manufacturing Co. has announced the appointment of A. F. McGraw to the position of Sales Promotion Manager of the Tractor Division at Milwaukee. For the past four years, McGraw has served the company as Industrial Sales Manager under O. J. Thomas at the Kansas City Branch.

In his new capacity, Mr. McGraw will direct the sales promotional activities of the Tractor Division in both the Industrial and Agricultural Departments of Allis-Chalmers.

New Bucket Loader

The Barber-Greene Model 82 bucket loader for handling sand, gravel, stone and similar material in material yards, on road jobs, etc., which was on display at the Barber-Greene booth at the Road Show, has a 2 to 3-cubic yard capacity per minute.

The main frame of the unit consists primarily of a welded box of ¼-inch plate in which all driving mechanisms are contained. All levers and controls are assembled on this basic unit. The loader superstructure is also of welded construction and bolted to the box unit. Spirals are standard on this loader. They are of a new all-steel welded construction and slip over and bolt to the driving shaft, making them easily replaceable. There is a double spiral on each side and, in staggered positions so synchronized that they provide an individual feed for each bucket. With a double pitch spiral extending half way to the end of the spiral shaft, and a single spiral completing the full width of feed, a uniform flow of material is carried to the buckets from the full width of the working face. A platform over the spiral safeguards the operator. The Model 82 is equipped with a swivel spout and a new quick-acting control device. A hand-wheel, located on the boom and in convenient reach of the operator, quickly and positively regulates the direction of discharge and automatically locks it when thrown out. The spout angle is adjustable.

The boom consists of two 6-inch channels with the cover plate located on the bottom side instead of the top. This is designed to relieve the possibility of material clogging around the bucket line idler rollers. Power is transmitted through a single strand of Rex A-508 steel-bushed roller chain to the automatic overload release sprocket. The buckets are 19 x 8 x 11¾ inches, of welded steel construction, and have a high back which aids discharge and increases capacity. The bucket lips are faced with a hard material to resist abrasion. The buckets are spaced 12 inches apart.

Power is supplied by a Buda 30-hp 4-cylinder gasoline engine equipped with a United oil bath air cleaner and Zenith carburetor. A Twin Disc Model C-8 clutch is used.

Complete specifications on this Model 82 loader may be secured by readers of this magazine direct from the Barber-Greene Co., Aurora, Ill.

Light-Weight Power Shovel For 3 to 5-Ton Trucks

The Quick-Way truck shovel, made by the Quick-Way Truck Shovel Mfg. Co., 43rd & Josephine Sts., Denver, Colo., is a light-weight power shovel easily mounted on any 3 to 5-ton truck, entirely portable, and readily convertible to a dragline, clamshell, orangepeel, crane or pile-driver as the job requires. The Quick-Way is full revolving and operates on an average of 2 gallons of gasoline an hour. The bucket has a struck capacity of 4/10-yard and actually can handle over ½-yard, according to the manufacturer. The shovel boom is an all-welded steel box girder type 16 feet 9 inches long. The dipper has a cast steel head and steel body with reinforced heel and lip for teeth, with a choice of either molychrome or manganese teeth, solid or replaceable tip, which are easily removed and replaced.

Power is furnished by an International 4-cylinder gasoline engine developing 35 hp at 1,000 rpm. It is equipped with gear-driven pump lubrication, built-in oil filter, clutch single plate completely enclosed in a bell housing, with a bar for throw-out conveniently arranged in a bank with the shovel operating levers.

Steps to Improve Access to 1939 World's Fair Site

Plans for completing New York City's new traffic tunnel under the East River, financed by a PWA loan and grant of $58,365,000, in time for the proposed World's Fair in 1939 took definite shape with the passage of a bill in the New York Legislature creating the East River Tunnel Authority, which will build and operate this latest addition to New York City's rapid transit facilities. The PWA loan and grant was announced January 2, 1936. The bill introduced was drafted by the PWA Legal Division and the Corporation Counsel of New York City, working in cooperation to make sure that the legislation when enacted will meet both PWA and municipal requirements and thus obviate any delay.

Immediately upon passage of the bill, the existing Authority resigned and was reappointed with no change in personnel.

The PWA project is comprised of a loan of $47,130,000 at 4 per cent interest, which is to be repaid from tolls collected by the Authority, and a grant of $11,235,000 to cover 30 per cent of the cost of labor and materials used. Construction of the new tunnel will create an immense amount of employment in Manhattan and Queens Boroughs and a much greater amount of indirect and industrial employment spread over many states where materials will be manufactured.

PWA projects improving transit facilities in New York City in addition to the East River Tunnel include the Mid-Town Tunnel, a $42,000,000 project under the Hudson River connecting Manhattan with New Jersey. The city plans eventually to connect this tunnel with the East River Tunnel by means of a third tunnel beneath Manhattan Island. Also there is the $44,200,000 Tri-Borough Bridge, a three-way bridge connecting Manhattan, Bronx and Queens Boroughs. Completion of the municipally-owned subway system is the third item for which PWA made a loan and grant of $25,350,000.

The East River Tunnel will have two traffic tubes, each carrying two lanes of traffic in the same direction. It will extend from 38th Street in Manhattan to a point near Borden and Jackson Avenues in Queens Borough. The tunnel proper will be approximately 3,800 feet long, while the approaches on Manhattan Island will be about 1,600 feet long and the Queens approaches about 2,400 feet long.

Speedy Work on Bridge over Arkansas River

(Continued from page 5)

Labor and Working Hours

The contractor used four 5-hour shifts on this contract. The shifts started at 7 A.M. and worked their five hours and then there was a 1-hour lay-off for dinner or supper, according to the time of day. The two night shifts worked entirely on excavation and cofferdam construction. Light for the night work was furnished by the Oklahoma Utilities Co. and open 100-watt lights were strung as needed.

The labor organization consisted of a total of five crane operators, eight carpenters, four carpenter's helpers, ten miscellaneous laborers of whom some were skilled, and fifty-five common laborers. The men were all hired from the Federal employment agency lists.

Quantities

Rock excavation	310 cubic yards
Reinforced concrete hand-rail	9 feet
Structural steel	1,775,000 pounds
Silicon structural steel	345,000 pounds
Concrete, Class A	925.4 cubic yards
Concrete, Class A, pier bases	492.5 cubic yards
Concrete, Class AA	763.7 cubic yards
Reinforcing steel	199,630 pounds
Reinforced concrete piling	800 linear feet
Reinforced concrete test pile	1 each

Personnel

Project NRS 400A, the concrete and steel highway bridge across the Arkansas River at Ralston, Okla., was completed by the contractor, List & Weatherly Construction Co., within the 200-working day limit of the contract. The contractor's headquarters office is in Kansas City, Mo., and field offices were located on the job on the north side of the river. E. E. Barber was Superintendent for the contractor, with W. E. Flory as Assistant Superintendent during the latter half of the work. N. B. Turner was Resident Engineer for the Oklahoma State Highway Department.

Subgrade Prepared by Power Unit

The R-B Power Finegrader, which was exhibited by the R-B Equipment Mfg. Co., 720 E. New Hampshire Ave., Royal Oak, Mich., at the Road Show in Cleveland last month, has been tested by the construction of over 500 miles of concrete pavements. This Finegrader cuts the grade to exact cross section, removes the excess soil from the grade, and smooths the subgrade, leaving it in a firm condition, accurate as to measurement with a minimum of voids, according to the manufacturer.

In operation a series of cutting knives move forward with a rotary motion, loosening and lifting the soil with each stroke. The blades are oscillated over a 1¼-inch stroke at the rate of 185 rpm. The knives pass over each spot five times, producing an excess of fines which are tossed back into the path of elevating flights traveling across the grade. The excess material is removed from the grade by the flights and is deposited along the shoulder of the roadbed through discharge elevators at the ends of the machine. All remaining particles are compacted to accurate cross-section by final smoothing blades. The cutting blades and smoothing members are easily adjustable to any cross section, either flat or crowned, without the use of extra parts.

The R-B Power Finegrader is made in two sizes, standard 10-foot and standard 20-foot. The 10-foot machine can be adjusted to 8 or 12-foot roads and is therefore well suited for widening operations, as well as for construction in those localities where a portion of the road must be held open for traffic. The standard 20-foot machine has a maximum range of adjustment from 18 to 20 feet. Special machines adjustable for 18 to 22-foot roads may be had at additional cost.

Picks and Shovels

(Continued from page 1)

of Massachusetts Bay and the Colony of Connecticut was made in 1713. However, in 1749 the Legislature of Connecticut passed a resolution declaring the determinations of the 1713 commission null and void, inasmuch as they had not been approved by the King, which was heartily confirmed by the Crown.

In 1791 Massachusetts and Connecticut appointed commissioners to establish the boundary between them, but the commissioners were unable to agree. In 1803 commissioners were again appointed, this time to settle the boundary west of the Connecticut River, a compromise having been effected concerning the line between the town of Southwick and the towns of Suffield and Granby, the cause of the disagreement of the former commissioners.

The line involving the peculiar jog was then set, the reason for this deviation from a straight boundary, known as the Southwick Jog, being that in adjusting errors in the boundary line as previously run by compass a long, narrow strip of land was given to Connecticut and the Southwick jog was ceded to Massachusetts as an equivalent area to make up for it.

Dinosaurs to Goldfish at A.R.B.A. Road Show

Road Builders Rule Town As Contractors Gather With Highway Officials to See New Machines

SOME Show! Between $2,500,000 and $3,000,000 worth of equipment exhibited—a contractor's paradise. Much of it rolled into the huge underground Exhibition Hall in Cleveland under its own power, even the largest piece shown, the Lima 2¼-yard shovel, weighing 137,000 pounds. What was the smallest exhibit? Our guess was somebody's ball bearings. The attendance was far beyond the hopes of A.R.B.A. officers and topped 16,150 for the six days the Show was open in the great Municipal Auditorium.

There was plenty of noise and action, movies that talked, movies that shouted and some that mercifully were silent and stuck to their captions. The place was cleaned continuously by an efficient corps of men who swept up and disposed of several hundred million cigar butts, cigarette stubs, gum wrappers and the like, but the aisles and booths were clean. Our Observing Reporter strolled through the entire Show and sent back this story of the Highlights of outstanding exhibits.

CONTRACTORS & ENGINEERS MONTHLY greeted the visitor as he entered the first Exhibition Hall and showed not only copies of the January issue but panels of enlarged reproductions of the first page with vari-colored catalog covers mounted on black backgrounds. The flashing red traffic light of the Signal Service Corp. exhibit across the aisle gave color and life to the panels. Right across the main aisle was the Klauer Mfg. Co. big Snogo rotary snow plow that gathered in imaginary snow with its triple tier of double spiral feeders, sucked it in with the huge fan or rotor and then made it visible to the passerby by a long cloth tube attached to the discharge. The long snake-like tube as it floated out into the air made one think of the posters of "The Ghost Goes West," and effectively showed how the discharge could be changed from one side to the other.

The United States Steel Corp. and subsidiaries showed a large model of an underpass as it should be built to provide a safe crossing of two major highways. The products of these associated companies were shown in use on this steel and cement structure which included the steel bridge proper with expanded arch beam construction, guard rails, light standards, highway signs, culverts, reinforcing steel, I-beam Lok steel flooring for the bridge, concrete and tube steel railings, white concrete traffic markers and curbs. A rear projection movie showed the story of steel and cement for highway service.

Timken Roller Bearing Co. had an exhibit that caught your eye because of the unusual reproduction of a huge tapered roller bearing in relief. It looked as though you could walk right up to it and spin the rollers.

Nearly opposite the roller bearing exhibit was the United American Bosch display where a complete American Bosch fuel ignition system for a 6-cylinder diesel engine was in operation. This included the fuel injection pump, transfer pump, variable injection timing device, adjustable coupling, a minimum-maximum speed governor, and six spray nozzles of the pintle and multiple-hole types delivering an emulsion into six glass cylinders to show the kinds of sprays produced.

S.R.O. Indeed!

The "Little Theatre on the Ramp" was playing to S.R.O. most of the Show and Lieut. Commander G. O. Noville, Executive Officer of the Second Byrd Antarctic Expedition literally "knocked 'em cold" with his illustrated talk on the events of the expedition in which a Cletrac crawler tractor played such an important role. A group of nearly three dozen manufacturers and the U. S. Bureau of Public Roads put on the motion pictures showing their own products in action and the results of good and poor construction and maintenance.

American Manganese Steel Co. showed

(Continued on following page)

A Vivid and Colorful Exhibit at the Road Show

a ¼-size model of a 2½-yard bucket—but don't be fooled, it was made of wood. It was a remarkable wood carving job and was lots easier to handle than a manganese steel bucket the same size. They also showed American Brake Shoe & Foundry Co. cast-iron permanent railroad crossings and cast-iron curb guards for the entrances to filling stations.

Armco Culvert Mfrs. Assn. had a moving transparency showing the effect of poor drainage of the subgrade under a hard surface road and adjacent to it an installation of Armco Hel-Cor perforated pipe with a cut section below. There was also an 8-foot diameter Armco Multi-Plate culvert with enlarged reproductions of actual photographs of the installation with the real Multi-Plate inside. The exhibit also included a display of metal cribbing and paved invert culverts.

Dow Chemical Co. had a miniature stabilized road against a striking blue background with chrome trimmings. The road was divided into three sections, one showing the roadway in 1920 when it required one day for the miniature truck loaded with produce to flounder its way over the unimproved soil road. The next section, labeled 1930, showed a semi-improved loose, dusty gravel road which required four hours of travel to get to market. The third part, labeled 1936, showed a section of stabilized road laid with natural binder soil and Dow Flake over which the truck could reach market in two hours.

Think of it, a truck that has been driven 231,735 miles, according to the sworn statement framed beside the display of parts of the truck engine, was part of the Chevrolet Motor Co. display. In addition there were several models of trucks, a survey-party closed-body truck that some folks might call a station wagon, and a stripped chassis.

Waukesha Motor Co.'s exhibit caught your eye with its blue carpets and runners and a background of black velvet hangings, and ferns. The exhibit included a 125-hp 6-cylinder gasoline engine, an 80-hp 6-cylinder diesel, a Waukesha-Hesselman 135-185-hp 6-cylinder engine, a 60-75-hp 6-cylinder unit and a 47-hp 4-cylinder unit.

The next thing that caught your eye was an enormous double loop of red piping which trembled a bit as a Rex Pumpcrete unit sent an almost continuous stream of 1:2:4 "synthetic" concrete through the 110-foot pipe line. This 7-inch pipe line was composed of six 90-degree elbows, two 45-degree elbows, one 10-foot straight section, and one 22½-degree elbow. The Model 200 Rex Pumpcrete single unit equipped with a remixer operated intermittently. With this as a background, there were displayed a 1½-yard Moto-Mixer with two speed transmission on a 131-inch Ford truck animated by an electric motor, 4, 3 and 2-inch portable centrifugals, and a 2-inch 10M 10,000-gpm self-priming centrifugal pump rigged to show the self-priming principle. The liquid looked like grape juice but we didn't sample it.

There was also a bituminous mixer for cut-back in cold patch work and under a glass dome a piece of 3-inch aggregate which was delivered by a Rex Pumpcrete for the power house at Hoover Dam.

Perhaps the most striking exhibit in the whole Show was Gar Wood's restful lounge with plum-colored carpets, red leather upholstered chrome tube chairs and illuminated transparencies showing Gar Wood products. One end of the exhibit was a long concealed coat room for visitors. Gar Wood showed plenty of his heavy equipment attached to tractors on the floor below.

Against hangings of black and yellow St. Paul Hydraulic Hoist Co. showed models of St. Paul vertical and underbody hoists for dump trucks. There were four models of 1/16th size, all of which operated and were complete in every detail even to representations of the Alemite and Zerk fittings. A complete new horizontal dump hydraulic hoist with a mucker-type body raised to an angle of 77 degrees was shown. The hoist was double acting and had a hydraulic check.

Down Among the Monsters

Thew Shovel Co.'s striking yellow cabs stood out to catch the eye. The new 2-yard Lorain 87 and the 77 diesels stood side by side with green steps and a built-in platform between them. Then came a lounge area all carpeted with green mottled linoleum and the large circular insignia of the Thew Center Drive. The other side of the exhibit was a Universal-Lorain 40 crawler shovel paired with another 40 mounted on an Indiana truck. The background of the lounge was a large double panel showing two huge draglines at work.

When you reached this end of the exhibit hall it was a little difficult to get out from under the spell of the huge machines that towered like prehistoric monsters on every side.

Below the Neon sign "P & H Pacemakers," Harnischfeger Corp. showed a Model 765 shovel, P & H-Hansen welders and a Model 100 ⅜-yard shovel.

Just across the aisle towered the Koeh-

(Continued on page 36)

Plans for New Roads in South America

(Continued from page 11)

priations: $14,600,000 for roads now under construction; $4,300,000 for contracts already awarded but upon which activity has not yet begun; $600,000 for work being bid upon but not awarded; and $2,100,000 for construction approved but for which bids had not yet been called. The allocation of these funds presumes the construction of the following: 134 sections of ordinary dirt roads with a length of 2,801 miles; 62 sections of improved dirt roads of 627 miles; 15 sections of concrete of 231 miles; 24 sections of macadam with a length of 473 miles; 5 sections of asphalt surfacing of 50 miles and one section of experimental gravel-bound road of 6 miles.

The construction of national highways in Argentine is done by contract, the bidding being open to any contractor, native or foreigner, who wishes to submit a bid. While hand labor is used considerably in road work, up-to-date road building equipment is also in use.

Brazil

The government of Brazil is now realizing the necessity of concentrating on and centralizing its means of communications. Until recently, there has been no organized highway system, roads having been built by the states (or provinces), municipalities, private companies and plantation owners, according to their requirements or desires. The Federal government is now taking over many of these roads and planning a definite highway system.

The sections around Rio and Santos, in the rich coffee country, have modern well-paved roads, but the other vast sections to the north, west and south, are almost totally undeveloped.

At present business conditions in Brazil are excellent. Now that they are out of the financial morass in which they have been floundering, the government is able to concentrate on a planned system of highways. The problem, however, is a basic one. Commercial and economic development in the now undeveloped sections of Brazil must be undertaken in order to justify extensive road building which, on the other hand, is a necessary factor in agricultural and economic development.

During 1933-34, under the auspices of the Cocoa Institute of Bahia, Brazil, 159 miles of roads were completed and opened to traffic; 64 miles repaired, 71 miles leased and 192 miles projected, in addition to which nine concrete bridges were constructed. The roads are mostly of dirt and crushed stone surfaces.

Chile

Chile's highway program for the past three years has been concentrated on maintenance rather than on new construction, although studies have been made for a five-year permanent road and bridge construction program. Shortage of funds has been the primary factor in the concentration on maintenance but with the better economic condition in which Chile now finds itself, it may be expected that reasonable and steady development in road construction will occur from now on.

The highway mileage by types as reported by the Bureau of Foreign and Domestic Commerce for 1934 is as follows:

Hard-Surfaced Roads	
Concrete	151.3 miles
Bituminous concrete	9.0 miles
Bituminous macadam	27.5 miles
Total	187.8 miles
Intermediate Types	
Oil-mix	7.6 miles
Oil treatment (gravel)	19.4 miles
Other types	12.8 miles
Total	39.8 miles
Earth Roads	
Macadam	648.3 miles
Gravel	3,111.6 miles
Sand and clay	1,079.6 miles
Unimproved dirt roads	19,677.7 miles
Total	24,517.2 miles
Grand Total	24,744.8 miles

Ecuador and Peru

The main highway of Ecuador runs centrally south from Tulcán on the Colombian border through Ibarra to Quito, the capital, and south to Riobamba. This road, which will be a section of the Pan-American Highway, is to be continued south through Azogues, Cuenca and Loja to the Peruvian border. The total length of this section of the road, from Riobamba, will be about 185 miles, of which three sections totalling about 87 miles are now in service. All roads in Ecuador are dirt.

From Riobamba west through Guaranda to Babahoyo there is a road, open only about five months of the year. This is mountainous tropical country and dirt roads cannot be maintained during the rainy season. Paving is the only solution to the problem but is at present too expensive to undertake.

Two sections of the main highway have a crude type of paving designed to keep the roads at least passable when wet. These sections have been paved with stones of various sizes laid into the earth on rows to provide some drainage as well as traction.

The general plan is to develop roads from the main highway westward to the coast, through the developed and populated section of the country. The eastern half of the country, while potentially rich agriculturally and geologically, is mainly unexplored jungle.

One project now under way is a road from Quito northwest to Esmeraldas on the coast and another extends from Quito southwest to Chone. Particularly important at present is a road westward from Loja, the southernmost large town in Ecuador, to Puerto Bolivar on which

effort is being concentrated just now. This is an important gold mining section and the road is being financed by taxes paid by the mining company and guaranteed by the government to be used exclusively for this road. About 53 miles of this road has already been constructed.

All road work in Ecuador is done by government forces, which is felt to be a less expensive though slower method.

With an area of 482,258 square miles, Peru had in May 1934 12,504 miles of highways. Of this total there were 2,496 miles of unimproved earth roads; 3,365 miles of improved earth; 4,780 miles of crushed stone; 1,328 miles of water-bound macadam; 59 miles of cement concrete; 17 miles of reinforced concrete and 9 miles of asphaltic concrete roads. From April 1934 to May 1935, there were 347 miles of road constructed and 60 miles reconstructed.

The principal highway built during this period was the Central Highway, opened to traffic last June, which starts at Lima, the capital, and runs east, ascending the Andes, crossing the mountains at an altitude of 15,890 feet and descending by the eastern slope of the range to Oroya where a junction is made with the highway system of the Department of Junín. The road is 20 feet wide in all the recently constructed sections and somewhat less in the old parts. The first 25 miles are of concrete 8 inches thick. The balance of the roadbed has been rolled and in some sections given a surface of rubble. The paving of the highway will probably be continued with bituminous material.

Highway planning and supervision in Peru is under the Ministerio de Fomento (Department of Public Works) at Lima but construction and improvement of roads are carried out by three separate bodies; the Department of Public

(Continued on page 32)

Asphalt Heating on Mass. Job

(Continued from page 1)

material from the borrow pits at each end of the job and 30,000 cubic yards of excavation in cut. In addition, they moved 13,000 cubic yards of borrow for the Wey Construction Co., under a subcontract, for approaches to two bridges built by that contractor. A Caterpillar diesel Seventy-Five was used on one of the Carryalls and a Caterpillar diesel Ninety on the other two which were hauled in tandem.

Depending upon the character of the ground, an 8 and 12-inch gravel subbase was spread and rolled for the entire length of the contract. A Caterpillar Twenty patrol grader finished off the gravel base as spread by the Carryall scrapers after which it was rolled with a 14-ton Buffalo-Springfield gas roller.

Hauling Macadam Stone

All of the stone for the base and top course of the penetration macadam was hauled 27 miles, using six of the contractor's own Indiana 10-wheelers of the trailer type and ten hired trucks. The stone was spread by dumping from the trucks continuously into the hoppers of Nickerson stone spreaders, two of which were kept moving on the job, spreading stone for the 4-inch base course and 3-inch top course.

The base course stone was 2 to 1¼-inch sizes mixed and, after spreading with the machine, was touched up by a gang of three to four men under the direction of a foreman. Sand from piles spotted along the shoulder was spread and broomed by hand and then rolled with a 14-ton Buffalo-Springfield gas roller until all of the voids were filled and a firm base secured. There was no mechanical brooming whatsoever.

After the completion of the base course, 2-inch stone was spread for the 3-inch top course, rolled with two 14-ton and one 12-ton Buffalo-Springfield rollers after touching up by the hand crew and then penetrated with 2½ gallons per square yard of Socony Binder C asphalt by the contractor's own 1,000-gallon Etnyre distributor. The top was then immediately filled with ¾-inch hand-cast stone followed by rolling and hand brooming to fill completely the surface voids. The surface was later sealed with ⅜-gallon of the Binder C, as soon as twenty-four hours after the completion of the top course, and as long as three weeks after its completion.

On this NRS Project 254, there were 87 employees working in two six-hour shifts, one from 6 to 12 in the morning and the other from 12:30 to 6:30 in the afternoon.

Major Quantities and Unit Prices

Item	Quantity	Unit	Price
Excavation	37.500	cubic yards	$ .30
Borrow	10.000	cubic yards	.20
Asphalt	135.000	gallons	.12
Broken stone	5.100	cubic yards	4.00
Top stone, bituminous macadam	3.700	cubic yards	4.45
Gravel	15.500	cubic yards	.30
Sand, binder	1.180	cubic yards	1.00
Slopes	91.500	square yards	.03
Loam	6.500	cubic yards	.90
Seeding	49.000	square yards	.05

Personnel

This contract for 3.1 miles of bituminous macadam paving on gravel base, and including necessary grading, was awarded to the Lane Construction Co., Meriden Conn., for $97,560.00. W. E. Sikes was Superintendent and J. H. Higgins, Assistant Superintendent for the contractor. Frank J. Weisse was Resident Engineer for the State Department of Public Works.

Modern highways need a dense surface of non-skid character for safety, and to resist the destructive suction of balloon-tires which in their ability to tear up the surface are comparable to the old vacuum cup tires. —Samuel Eckels, Chairman of Board, Allegheny County Authority, Pittsburgh, Pa.

Aluminum Truck Body in Service at Hoover Dam

Aluminum Enters Construction Field

Aluminum, although a recent entry into the field of heavy construction equipment, has already demonstrated its wide uses and applications together with its economy. Once considered a precious metal, it is today classed among the common metals as a result of Charles Martin Hall's discovery on Feb. 23, 1886 of a process for producing it economically.

One of the major developments in the construction field is the application of aluminum, which is this year celebrating the fiftieth anniversary of its commercial availability, for booms on excavating equipment. The aluminum boom with its longer reach and higher output is used on excavation, foundation, highway and irrigation projects, levee building and material handling. Light-weight booms of aluminum have been substituted for other booms of equal length and strength with savings of 40 to 50 per cent in weight. On an average boom, this saving in weight can be utilized by an increase of from 15 to 20 per cent in boom length or an increase of from 20 to 25 per cent in bucket capacity, without loss in speed or mobility.

The largest metal boom ever built was recently completed for use in a limestone quarry in Argentine. The total length of this boom is 250 feet, of which 150 feet is aluminum, the balance steel.

The use of aluminum in excavating equipment has not stopped with the boom but has extended to include buckets as well. While the aluminum boom increases reach, the aluminum bucket increases capacity without additional operating expense. Service tests have shown that the substitution of aluminum for steel gives adequate strength and durability; and as the digging ability of a bucket depends on the relative location of the drag hitches and cutting edge, dead weight in the bucket is not essential to fast digging except in rock and very hard ground.

Use for Trucks

For the past six years, aluminum alloy truck bodies have proved valuable in many kinds of service, but proof of their ability to stand up under difficult conditions came at Hoover Dam. There the average load consisting of blasted rocks weighing as much as 2,000 pounds each, was dropped into the truck by power shovels from a height of 6 to 8 feet. Frequently rocks weighing as much as 10 tons were loaded without damaging the body because of aluminum's ability to absorb impact.

The aluminum body has a level capacity of 16 cubic yards and in appearance resembles a dragline bucket. The floor consists of strong aluminum plate reinforced by rectangular bar and laid over a 2½-inch subfloor of pine. The bolsters and side posts are continuous and consist of two 4-inch aluminum channels formed at 90 degrees on a 20-inch inside radius and riveted back to back. The longitudinal members are 6-inch aluminum channels riveted back to back. The aluminum construction of the body allows the operator to save over 6,000 pounds in dead weight and to transfer this saving into earnings.

The advantage of aluminum equipment in the direct saving of operating expenses is important, while the saving of time can not be ignored. Aluminization leads to increase in speed of construction, which in turn means savings in interest, overhead and labor.

New Monthly Publication for Equipment Dealers

The Associated Equipment Distributors displayed the new *A.E.D. Triangle* for the first time at the American Road Builders' Association Convention. The *Triangle* is to be the official house organ of the distributors, with Morton R. Hunter as Managing Editor.

The first issue contains an article by John C. Louis, President of A.E.D., on the importance of the Distributors 1936 Convention, an article by Charles M. Upham, Engineer-Director of the A.R.B.A. on the Road Show at Cleveland and other interesting contributions.

We welcome the *A.E.D. Triangle* as the new voice of the Associated Equipment Distributors.

New Earth-Moving Carrier Handles 30 Cubic Yards

A 30-yard capacity side-dump earth carrier built for use with large tractors, and without the front axle for use with trucks as a semi-trailer, has been announced by R. G. LeTourneau, Inc., Peoria, Ill., and Stockton, Calif. This Cradledump Buggy has a body 9 x 13 feet able to carry approximately 35 yards loose measure and big enough to make the careful spotting of shovel buckets unnecessary when loading to the Buggy.

Unloading is controlled from the tractor driver's seat by means of half-inch steel cables and sheaves connected to a standard two-drum power-control unit mounted at the rear of the tractor motor. The body is pivoted at the top and expels its load by moving in a cradle-like arc to the side, forcing the entire load off the Buggy as it moves. One line from the power control unit controls this dumping process and the other line returns the body to the loading position and holds it there.

Both the Cradledump Buggy and the Hug Model-100 tractor-truck which is used for hauling the Buggy when built as a semi-trailer are mounted on 18.00 x 24 tires with six tires on the truck and four on the Cradledump trailer. When used with tractors, the Buggy is equipped with eight of these tires, mounted front and rear in dual sets. The Hug tractor-truck built especially for use with this Buggy has a 4-wheel drive and is powered by a Caterpillar diesel Model-D13000 engine. It is capable of driving the unit at a top speed of 29 miles per hour in overdrive and has a low speed of 1½ miles per hour.

The New LeTourneau 30-Yard Earth-Moving Trailer With the Hug Model 100 Tractor Truck

Traffic Markers Scrub Paint into Surface

Traffic Chief traffic line markers, which were exhibited by the Wright-Dalton Machinery Co., Durham, N.C., at the Road Show last month, paint solid or skip lines from 2 to 6 inches in width, depending on the width of the brush. The principle of this marker is that it rolls the paint and scrubs it into the pores of the surface. Any paint or enamel that can be applied with a brush can be used.

The brush is completely circular, applying the paint with a rolling, dragging motion. In painting solid lines, the brush contacts the road surface continuously. By operating the resetting lever on the left handle of the machine, intermittent lines, caused by the raising and lowering of the brush, can be painted. On this type of stripe, the brush contacts the surface for 5½ feet and then skips 5½ feet. The paint conveyor is an endless belt, conveying the paint from the tank to the brush and keeping the paint in the tank agitated while the machine is in operation. The priming handle furnishes fresh paint for a new start after the machine has been idle for several hours. A regulator lever supplies the correct amount of paint for rough or smooth pavement conditions. The paint container or tank is a separate unit, of 7-gallon capacity, which can be lifted from the chassis and handled like a paint bucket.

Traffic Chief zone markers are made in four models, equipped to meet all highway and city marking problems. Model H. P. is powered by a 3-hp gasoline engine and is designed for use where miles of highways or city streets are to be marked. It has a normal operating speed of 4 to 8 miles an hour, depending on surface conditions. Model H. T. can be operated by hand or attached to a moving truck. When pulled by a truck, it will apply paint at the rate of 4 to 6 miles an hour, either solid or intermittent marking.

Model H, also designed for solid or intermittent marking, is operated by hand and applies paint at the rate of about 4 miles an hour. Model C is a hand machine, designed primarily for city traffic marking. It applies paint in a solid line only, 2 to 4 inches in width.

Further details on these markers may be secured by state, county and city engineers direct from the manufacturer.

Surfacing and Safety

A suggestion which makes for safety in wet or freezing weather is set forth by F. W. Weir, Engineer of Lincoln County, Ontario, in a recent issue of *Engineering and Contract Record*. In surface treating a road Mr. Weir advocates the use of a larger stone chip than the ⅜-inch chip in common use and also plenty of stone for cover, at least 20 pounds per square yard with a minimum quantity of bituminous material. This makes a stone surface instead of a bituminous surface and reduces the slippery conditions in wet as well as in frosty weather.

Pennsylvania will put to work 1,000 persons on its state-wide highway planning project to require 18 months and $650,000 from State and Federal funds.
—J. E. Kaulfuss, Professor of Highway Engineering, Pennsylvania State College.

Avoid Legal Pitfalls

These brief abstracts of court decisions may aid you. Local ordinances or state laws may alter conditions in your community. If in doubt consult your own attorney.

Edited by A. L. H. STREET, Attorney-at-Law.

Can Public Boards Discriminate in Favor of Hand Labor?

In determining who is the lowest responsible bidder for a public job, no discrimination can be legally made against the use of machine, instead of hand labor, if the bid for machine labor is the lower, unless there is a governing statute permitting such discrimination. That is the substance of a decision rendered lately by the Court of Common Pleas for Luzerne County, Pennsylvania, in the case of Perry v. Borough of Wyoming, 24 Pa. Munic. Law Rep. 113.

Defendant Borough called for bids to construct a storm sewer, separate proposals to be made for doing the work by hand and by machine. The bidding specifications also required that all manual labor be done by residents of the borough.

Futch bid $12,091.90 for hand labor and $10,595.90 for machine labor. The Goeringer Construction Co. bid $14,371.70 for hand labor and $9,819.90 for machine labor.

The Borough authorities awarded the contract to Futch on his bid for hand labor. But the court enjoined the award on the ground that the Goeringer Construction Co. was the lowest responsible bidder, although its low bid involved machine labor. We quote, in part, the decision and reasoning of the court:

"A provision limiting the territory from which a bidder must procure labor undoubtedly tends to conflict with the requirement that the contract be let to the lowest responsible bidder, if such provision in anywise tends to increase the cost of the work . . .

"No greater benefit will be conferred upon the borough by the use of hand labor instead of machinery. The difference between the two bids amounts to approximately one-sixth of the contract price. While the provision that contracts shall be made with the lowest financially responsible bidder does not prevent municipal authorities, in the exercise of a sound discretion, from determining who is the lowest responsible bidder, their conclusion must rest upon a full and honest investigation of the respective bidders. If a bidder measures up to the law's requirements as a responsible bidder, the authorities cannot capriciously award the contract to another . . . . The statutory requirement that municipal contracts be awarded to the lowest responsible bidder is mandatory . . . and cannot be disregarded by courts or municipal officials even though the purpose be to furnish work to the unemployed. This result may be effectuated by employing laborers to do work other than that designated in the contract, but does not justify the award of the contract to a higher bidder."

Where Is Equipment Taxable?

"Mr. Contractor, you have not paid any taxes on your road building and paving equipment. The City is hard up, so please ante." That, in substance if not exact words, is what the city of La Grange, Ga., said to Contractor Whitley.

"But," said Mr. Whitley, "this equipment has never been within the limits of this city. It is moved from place to place over the state where and when I need it."

"However," rejoined the City, "you reside here and the only office you maintain is here. That makes the location of the property constructively within the city."

In a lawsuit that followed, the Georgia Supreme Court decided that the City was right in its contention, even though its charter limited the power of taxation to "real and personal property within the corporate limits of said city." (O'Neal v. Whitley, 170 S. E. 376.)

The decision was influenced by the facts that the equipment had no permanent situs in any other municipality and had not been taxed in any other municipality. The court said:

"The city is presumably holding out to him the same protection of the property in question as it provides for all other like property situated within the city limits, and he is at liberty to avail himself at any time of these advantages. The fact that he has a choice about the matter is itself a benefit, and certainly where his property has no permanently fixed status at any other place it cannot be relieved from taxation merely because it is kept without the corporate limits of the municipality."

Validity of Licensing Laws

A law forbidding bald-headed or red-headed men to engage in the contracting business would be manifestly void as an unconstitutional restraint upon one's freedom to follow a useful and lawful pursuit. Legal restraints upon engaging in business must not exceed what is reasonably required by the public interest.

The Arizona Supreme Court was lately called upon to determine whether the Legislature had exceeded its powers in requiring contractors to obtain licenses, based upon a showing of good reputation, etc., and subject to revocation for inexcusable abandonment of contracts, dishonest practices, law violations, etc.

Following the reasoning of California District Court of Appeal in a case where a similar statute was upheld in that state, the Supreme Court decided (Hunt v. Douglas Lumber Co., 17 Pac. 2d, 815), that the law is justified as a measure designed to protect the public against fraudulent and illegal practices.

In the same case it was decided that, as between owner and contractor, an agreement made by an unlicensed contractor is void, but that a material man furnishing materials without knowledge that the contractor was unlicensed is not debarred from enforcing a mechanic's lien.

Right to Jail a Contractor for Neglect to Pay Bills

When a contractor collects a goodly sum of money on a job, it may be dishonest for him not to pay his laundry bill, and other obligations. But public policy has decreed that imprisonment for debts not fraudulently incurred should be prohibited.

Some of the state legislatures have attempted to harmonize the constitutional prohibition against imprisonment for failure to pay debts with the idea that a contractor should be locked in the "Bastille" on failing to pay off labor and material bills, particularly when such bills are lienable.

That is what the South Dakota Legislature tried to do when it enacted that a contractor should be guilty of embezzlement on failing to use money received from an owner for the discharge of such bills.

But, in the case of Commercial National Bank v. Smith, 244 N. W. 521, the South Dakota Supreme Court declared the provision to be void, adopting the following language used by the California District Court of Appeal in adjudging a similar act to be invalid:

"In all free governments the good sense of mankind, since the day when imprisonment for debt was abolished, has condemned and frowned down any attempt to coerce the performance of civil obligations by criminal penalties."

A New Model 30 Tractor

The new Model 30 Cletrac tractor, announced by the Cleveland Tractor Co., Cleveland, Ohio, develops 33 horsepower at the drawbar and 38 belt horsepower. The power unit is a 6-cylinder, 3¾ x 4¼ engine with force feed lubrication to the crankshaft connecting rods and timing gears. Six-volt starting and ignition units are standard equipment. There are three speeds forward—1.75, 2.75 and 4.25 mph. Steering is by the Cletrac controlled differential. The underslung drawbar permits pull to the track frame shaft without putting an excessive load on the transmission case. The operator is fully protected and the steering and throttle control levers are located within easy reach.

Fighting Snows of Maine Part of Maintenance Job

(Continued from page 7)

	Trucks		
	Pneumatic Tires With Wings	Without Wings	Pneumatic All Wheels Driven
1½ Ton	$1.75	$1.60	
2 Ton	2.10	1.90	$2.40
2½ Ton	2.40	2.25	2.70
3 Ton	3.25	3.10	4.00
3½ Ton	3.75	3.60	4.50
5 Ton	4.00		5.50
6-7 Ton	5.00		6.00

For snow removal on the state highway system during the present winter, the following state-owned equipment has been provided:

10 6-7-ton trucks of 4-wheel drive type equipped with V plows and wings with full power hydraulic control.
2 3½-ton trucks of 4-wheel drive type equipped with V plows and wings with hand winch control.
3 3½-ton trucks of 4-wheel drive type equipped with blade plows and wings with full power hydraulic control.
3 1½-ton trucks equipped with blade plows and wings with hand hydraulic control.
1 10-ton tractor with plow equipment.
1 14-ton tractor with plow equipment.

The Department has also erected approximately 200 miles of snow fence.

Snow removal is under the direction of the Superintendent of Maintenance, and under the immediate field supervision of forty-one supervisors.

Winter Gas Tax Offsets Snow Removal Costs

It is interesting to note that the cost of snow removal in 1934-1935 for all classes of road, including 11,800 miles, was $934,239 while the income from the gasoline tax for the four winter months of December, January, February and March was $985,024.

New Streamline Hoists for Dump Bodies

Termed "the first of the streamline hoists" by the manufacturer, the Models H-6 and H-7 Commercial hydraulic hoists which were displayed at the Road Show by the Commercial Shearing & Stamping Co., Youngstown, Ohio, are designed for all 1936 models of 1½ and 2-ton trucks. These hoists are a single casting, with a single sleeve for short wheelbase chassis and two sleeves for long wheelbase chassis.

Features of these hoists are the outside packed jack with self-adjusting packing; the elimination of piping and tubing in the entire assembly; a powerful pump with hardened and ground alloy steel gears; an overload relief valve to assure protection at every point in the stroke of the hoists, automatically reducing pump bypass pressure to a safe limit; a 50-degree dumping angle; and the totally-enclosed pump and valve, constantly running in oil and yet quickly removable.

The complete unit is quickly removable and completely reversible for right or left-hand drive and for clockwise or counter-clockwise pump rotation. It is claimed that these hoists require only 23 seconds to raise the body of the truck and the same to lower it.

Literature describing and illustrating these hoists may be secured by interested contractors and engineers direct from the manufacturer.

Republic Steel Moves Office

The general offices of the Republic Steel Corp. were moved from Youngstown, Ohio, last month to Cleveland where they will occupy floors 13 to 16 in the former Medical Arts Building, recently renamed the Republic Building. The move consolidates the general offices which have been located in Youngstown, the executive and Cleveland district sales offices formerly in the Union Trust Bldg., Cleveland, and the Advertising Department, Massillon, Ohio. The sales office of the Newton Steel Co. will also be located in the Republic Bldg., Cleveland.

The sales office of the Alloy Steel Division of Republic will remain in Massillon.

Posts for Snow Fence and Highway Signs

Bethlehem posts for snow fence and highway signs, made by the Bethlehem Steel Co., Bethlehem, Pa., are rolled from rail steel to a wide-flange channel section, designed to maintain proper vertical support. These posts come in a variety of sizes, Nos. 1 to 6 being considered of ample bearing surface to maintain rigid support without the use of anchor plates. No. 0, being of narrower section, is always supplied with anchor or ground plates and the others may also be had with plates at extra cost. Where the anchor plates are used, they are riveted to the back of the post. They are furnished in two sizes necessary to provide ample support for any of the posts.

As a snow fence post, the specially designed flanged channel is equipped with five rivet lugs, spaced to accommodate the five cable wires of the snow fence. The lugs can be riveted to any post section and at any spacing desirable. These lugs permit quick and easy fastening of snow fence which is allowed to ride freely on them. The snug fit of the fence between the rounded surface of the lug and the post makes a secure support without the necessity of closing the lugs. Posts are pointed to facilitate driving and painted red to match the snow fence.

Posts for highway signs and markers utilize the same wide-flange channel sections as for the snow fence posts. These posts are punched with any number of holes, as requested. If not specified, holes are punched ⅜-inch in diameter 1 inch center to center. As with the snow fence posts, the highway sign posts are supplied in all the standard weights. Special lengths are furnished when requested.

Lubrication Queries

Is some lubrication problem bothering you? Tell us about it and we shall be glad to help you.

Question

Does graphite in a grease actually improve its lubricating qualities for general use?—Omaha, Nebr.

Answer

Yes. Perhaps the experience of certain manufacturers of construction equipment in testing and selecting their lubricants will be useful to you. One large manufacturer of steam shovels has found that the use of pure electric-furnace graphite cup grease materially eliminates many sources of trouble in the operation of their machines. Another manufacturer of heavy cranes has found that graphite grease withstands the tremendous pressures and the varying temperatures usually present in the operation of overhead cranes. Manufacturers of many other types of equipment have also standardized on the use of graphite grease for the assembly of their machines and recommended its use for the future operation and well being of the equipment.

There is one warning regarding the use of graphite greases. Graphite does have a tendency to build up upon itself under heat. Thus, if a bearing is scored, a graphite grease will fill the scoring, making a smooth surface, but if heating continues the graphite may build up on itself and increase the scoring. If bearings are in good condition there is little chance of this building up.

Renewable-Lip Dippers

Amsco renewable-lip dippers, made by the American Manganese Steel Co., Chicago Heights, Ill., are designed for use with all makes of power shovels of ½-yard capacity and larger. This dipper, which is made of all-manganese steel, is claimed to combine the advantages of greater capacity, light weight and greater strength with the exclusive feature of quick, easy lip change.

It consists of a rugged cast manganese steel one-piece body and easily and quickly interchangeable manganese steel lip. The lips are made in several types, designed for fast digging in different classifications of material. All styles of lips are renewable and interchangeable on any dipper of a given size, the change being simply the loosening of two U-bolts and knocking out four keys, without removing the bucket from the shovel. The door is cast in one piece with hinges integral, thus reducing the weight.

Literature describing and illustrating these Amsco renewable-lip dippers, which were on exhibition at the Road Show last month, may be secured by readers of this magazine direct from the manufacturer.

"Tales of Service" Offered by Distributor

A new small publication, whose editor denies that it is a wheezy "house organ," has been announced under the title, "Tales of Service" by Service Supply Corp. and Rental Service Co., Inc., of Philadelphia and Harrisburg, Pa., and Atlantic City, N. J. They have asked all their friends to contribute "makings of a good grin," constructive thoughts, photographs and job stories.

Thus, another publication is added to the distributor group in which E. F. Craven Co., Greensboro, N. C., with its "Road Machinery News" and "The Look Around" of H. W. Moore Equipment Co., Denver, Colo., are leaders.

Panama to Have Road Across the Isthmus

In the twenty-one years of the existence of the Panama Canal, there has been no road across the Isthmus because of the Panama-United States treaty which gave to the United States the control of all means of communication along the Canal, both in the Zone and in the Republic of Panama.

With the new treaty under consideration, in which Panama will have the right to construct a highway, plans are being made by the Panama Road Board to build a highway, connecting up with the road to Madden Dam in the Canal Zone and extending across the Isthmus to Colon. This new road, which will be 27 miles long, 6 miles of which are in the Zone, will provide a modern 18-foot highway, of 9-inch concrete, from the Pacific side to the Atlantic. The maximum grade will be 8 per cent, and the bridges will be 20 feet wide.

The largest bridge to be constructed will be a 160-foot span with two approach spans of 100 feet each. There will be one bridge, with an average length of 76 feet, for each mile of road and an average of ten culverts per mile. The total estimated cost of the project is $3,614,000.

From Alajuela, near Madden Dam, to Colon, the route of the highway will be through rough terrain. The average excavation per mile is estimated at 40,000 cubic yards although the middle portion, of about 8 miles, will probably require 110,000 cubic yards of excavation per mile.

The work will be done with government forces under the supervision of Tomas Guardia, Chief of the Panama Road Board, who in his fifteen years in that position has built up an efficient road-building organization.

New Line of Light Trucks and Busses

Mack Trucks, Inc., 25 Broadway, New York City, has entered the low-price truck and bus field with a line of light Mack Jr trucks and busses in seven models which range from ½-ton to a 2 to 3-ton model. The Jr line also includes a short-wheelbase Traffic type model.

The ½-ton truck will have a wheelbase of 118 inches with a gross rating of 4,500 pounds. The 1½-ton model, with a gross rating of 10,000 pounds, and the 1½-2-ton truck, gross rating 11,500 pounds, will be available in wheelbases of 139 and 166 inches, and in special wheelbases ranging from 170 to 190 inches. The 2-3-ton model, gross rating 13,500 pounds, will be available in 142 and 166-inch wheelbases, as well as in special wheelbases ranging from 170 to 190 inches. The traffic type model in the 2-3-ton truck will be 166 inches, with special wheelbases up to 190 inches and a special 139-inch tractor wheelbase.

The ½-ton truck will be powered with a 6-cylinder gasoline engine developing 72 brake hp at 3,000 rpm. The 1½-ton Model 10M has an engine of 209 cubic inch displacement, four speed direct transmission and a 295¼-square inch total braking area. The engine of Model 20M, 1½-2-ton, is a 6-cylinder unit developing 74 hp at 3,000 rpm while the engine for the 2-3-ton model will have a brake hp of 85 at 3,000 rpm.

A feature available on the 10M, 20M and 30M models will be a two speed under-drive rear axle, which permits high-speed operation for long level stretches or for occasions where speed is desired more than power. By the operation of a lever in the cab, the under-drive additional ratio of 1.5 to 1 can be brought into operation to give ample gear reduction for hill climbing ability.

Deep Rock Cut on Wills Creek Dam

(Continued from page 15)

specified layers after the crawler wagons had dumped their loads as indicated by the spotter, with a Caterpillar tractor on which was mounted a LaPlant-Choate bulldozer and the same machine also hauled a sheepsfoot roller. Another Caterpillar Seventy-Five diesel tractor pulled a 6-yard LaPlant-Choate bottomless scraper for handling earth on the embankment.

When the stockpiled earth had all been moved to the embankment and the rock work was practically completed most of the hauling equipment was released from those duties to work under the Caterpillar elevating grader with a power-driven 48-inch belt. This outfit produced an average of 3,000 yards a day of embankment.

A Caterpillar 77 hydraulic-controlled grader pulled by one of the larger tractors was used to cut the slopes in the toe trench and to replace the bulldozer if that was out of service for any reason.

A C H & E triplex pump was placed on the bank of Wills Creek and furnished water for the sprinkling of the embankment.

Lighting for Night Work

As the contract was worked 20 hours a day it was necessary to supply a considerable amount of illumination. A total of 37 floodlights with 500-watt lamps were spaced about 150 feet apart over the entire operation from the rock cut to the length of the embankment. Current for the lights was furnished by a power plant consisting of a Caterpillar diesel engine and a General Electric generator of 37-kw capacity at 120 volts and single phase. The generator and power plant were well housed from the weather and mounted on 12 x 12-inch timbers and 3-inch planks. The timbers were beveled at the ends and the whole plant could be skidded from one point to another with one of the large tractors.

Care of Equipment

Because of the possible damage that might occur from the fine ground rock working into the many bearings and joints of the crawler equipment, the contractor arranged a high-pressure pump so that once each week every piece of crawler equipment could be treated to a "water cure." All the crawlers were washed out thoroughly with the high pressure water and then a high-pressure greasing outfit was used to fill every void with water-resistant grease to protect it from the abrasive material.

The contractor maintained a liberal supply of lubricants and used them regularly in the proper amount and the proper type of lubricant for each need. D-A lubricant was used for all tractor and crawler work.

Shifts and Labor

The contractor chose an unusual division of the shifts but worked it to advantage. There were four 5-hour shifts which worked six days a week and two 6-hour shifts which worked five days a week.

Personnel

The Muskingum Conservancy Project is in charge of Major J. D. Arthur, Jr., Corps of Engineers, U.S.A., as District Engineer. Theodore T. Knappen, Senior Engineer, is Chief of the Engineering Division. The Wills Creek Dam is in the Zanesville Area, Capt. F. S. Tandy, Area Engineer and 1st Lieut. F. X. Purcell, Jr., Resident Engineer. For the contractor, Edward J. Eiff, of Quincy, Ill., the work was in charge of M. W. O'Meara with W. H. Gholson as Superintendent.

New Vacuum Road Sweeper

One of the new pieces of equipment on display at the Road Show in Cleveland last month was the Hargrave vacuum road sweeper, made by the Hargrave Construction Co., Cedar Rapids, Iowa, for removing dust from roads to be given a seal or prime coat of oils, tar or asphalt. Five V-type belts drive the powerful suction fan which draws the dust and dirt through the suction nozzle and discharges it through the pivoting discharge nozzle, in any direction desired.

The vacuum sweeper is mounted on a heavy substantial frame and two-wheel trailer, making transportation and turning around on the road very simple. It is also furnished on skids or with a trailer. The unit can be hooked up directly behind a power broom or operated independently as a separate unit. Power is supplied by a Ford V-8 motor.

An attachment can be furnished which runs directly from the intake nozzle to a pan mounted over the rotary fibre broom of any sweeper, thus sucking all the dust created by the brooms back through the fan and discharged through the outlet spout. This is designed to reduce the hazard of sweeping and gives the operator a clear vision of the road ahead.

Literature describing and illustrating this new road sweeper may be secured by readers of this magazine direct from the Hargrave Construction Co.

The Investment Value of Our State Highways

As an investment, nothing is comparable to highways. Between 1919 and 1926, to cite a concrete example of the business benefits from highways, North Carolina constructed $125,000,000 worth of highways. What was the economic result? The number of farms in the state was increased by 13,000 during the period when the number of farms in the country as a whole was falling off. The true value of North Carolina property increased eight times between 1900 and 1926 while the entire United States was increasing the true value of property by only four times, according to Hon. Will M. Whittington of Mississippi, a ranking member of the Committee on Roads of the U. S. House of Representatives.

All-Purpose Electric Tool

A new idea in portable electric tools is embodied in the new Wodack Do-All combination electric hammer and drill recently announced by the Wodack Electric Tool Corp., 4627 W. Huron St., Chicago, Ill. The hammer mechanism is so constructed that there are only two working parts, both of which are of specially treated steels to give long life. The motor is of the universal type with forced draft ventilation, and the tool may be operated from any light socket. By simply opening the chuck and loosening a cap screw, the hammer member may be removed and the tool used as an electric drill, with a capacity of ⅜-inch in metal. The drill may also be used as a portable or bench-type grinder and buffer.

The hammer drills holes in concrete and masonry up to 1⅜ inch diameter, and by using special tools with it, it does chipping, chiseling, cutting and vibrating.

Alemite Safety Crusade

Using radio and magazine advertising, Alemite, a division of Stewart-Warner Corp., Chicago, Ill., has joined the national automobile safety movement with its own "Safety Crusade." The "Alemite Brigadiers Club" will be organized, consisting of motorists from all over the country to whom buttons and ABC license plate emblems will be furnished, to denote the club's slogan "Always Be Careful."

Alemite's interests in safe driving is a natural one as this company was among the pioneers in automotive progress, and its organization, long recognized as a leader among lubrication experts, and its executives feel that their interest in furthering safe driving will insure good will for the automotive industry in general by showing the public that the responsibility for greater safety lies, not with the car manufacturers, but with the motorists themselves who alone can make driving on the highways safe.

Today's Highway Designs Feature Traffic Safety

In discussing the control of highway traffic at the convention of the American Association of State Highway Officials a few weeks ago, Sidney J. Williams, Director, Public Safety Division, National Safety Council, pointed out that a highway is useless unless it conveys its traffic where the traffic wants to go, with a minimum of interference, congestion, delay and danger. The highway department is not providing simply slabs of concrete or asphalt, it is providing a transportation system and the essence of any transportation system is that it keep moving and arrive on time. This modern conception of a highway is reflected in many features of design and maintenance of present-day roads which clearly indicates that designers appreciate the need for adequate safe roads. Among these features are:

1. A 10-foot lane width, to provide clearance for safe passing at high speeds.
2. Long radius curves, widened, and superelevated to permit safe operation at the same speed that is regarded as normal on the tangents; or a conspicuous sign indicating the maximum safe speed for that curve.
3. Improved intersection design, ranging from widened approaches to complete separation, and including traffic control signals and signs as needed.
4. Similar improvements and protection at railroad crossings.
5. Shoulders free from obstructions, for disabled vehicles, and as a safeguard for any who run off the pavements; guard rails on fills and at some curves.
6. Adequate sight distances on both horizontal and vertical curves or conspicuous signs warning of their absence.
7. Illumination at those points where darkness is a hazard which ordinary headlighting will not adequately combat.
8. Center lines and lane lines, nonslip pavement surfaces, snow removal, removal of posts and other obstructions in the roadway.
9. Center separation of opposing streams of traffic, on all four-lane roads—this is a great improvement for comfortable and safe travel, which should be so strongly endorsed by highway organizations that any highway engineer would be ashamed ever to build or remodel a four-lane highway without it. Center separation is one strong reason for preferring four lanes to three.
10. And finally, signs which tell the motorist exactly what he needs to know, with regard to hazards ahead, as well as routes and distances, which always tell the truth, and which are of uniform aspect, location, and meaning all over the country.

One hundred per cent state-wide highway planning programs are projected for Washington, Oregon, California, Nevada, Idaho, Utah, Arizona, New Mexico, Colorado, Wyoming, Montana and Pennsylvania. U. S. Route 40 with the exception of New Jersey, Delaware and Maryland will be covered by surveys from coast to coast. —J. E. Kaulfuss, Professor of Highway Engineering, Pennsylvania State College.

A Combined Action of Conveying and Screening

Symons screens, made by the Nordberg Mfg. Co., Milwaukee, Wis., have a combined action of conveying and screening. Eccentrics provide positive vibration, and flexible supports for the decks are inclined at such an angle that the resulting movement carries the material forward and upward, the material actually traveling forward through an entire half instead of a quarter of the screen cycle. The movement is then sharply reversed, the holes freed and the cycle repeated. It is not necessary to incline Symons screens to secure travel for the material. Since they are placed level, the headroom is reduced.

These screens, which were exhibited at the Road Show, have a rugged drive unit housed and sealed at the discharge end. The screen cloth is attached to the frames, which are easily and quickly removed. Made in 2, 3, 3½ and 4-foot widths, in lengths up to 20 feet, with single, double and triple decks, these units are designed to meet a wide variety of separation and capacity requirements.

Early in January the Tygart River Rose to Within Less Than 3 Feet of the Top of the Cofferdam Sheeting for the Reservoir Dam Being Constructed by Frederick Snare Corp., New York City. At Its Height, the Flow Reached 22,000 Second-Feet as Compared with Normal Low Water Flow of About 500 Second-Feet and Maximum Flow, in July 1912, of 58,000 Second-Feet. The Cofferdam Was Not Flooded Although the Pumps Were Removed. Water Gradually Rose in It to a Depth of About 10 Feet Before Pumping Was Resumed.

Pan-American Union Photo

A Concrete Bridge on the Road From Trouin to Jacmel, Haiti

Plans for Future Roads in South America

(Continued from page 23)

Works; the commissions in each Peruvian Department, created by a decree of April 10, 1931 for the administration of funds obtained from taxes established to alleviate unemployment; and by special commissions appointed for the supervision and construction of certain roads.

Colombia and Venezuela

Colombia is another Latin American country with a progressive plan of highway improvement. For 1932-34, the Federal government budget for national roads was $4,650,000. In 1935, the national highway system measured 5,376 miles divided as follows: 4,967 miles of highways and 409 miles of pack trails. The total length in actual use in 1935 was 2,639 miles of highway and 173 miles of trails, leaving 2,326 and 236 miles, respectively, to be constructed.

The principal work of construction during 1934 was limited to roads connecting important centers of population with the Magdalena River; roads providing access to the eastern plains; roads connecting capitals of departments; the completion of three main highways and of several roads of national defense. During 1935, in addition to a continuation of those mentioned above, construction was started on a number of new roads as well as improvements in the road of the Cravo.

To take care of this work the government used about $3,702,000 of various funds, all taken from ordinary revenue, because the government could not collect an increase on rents and incomes.

Venezuela too is progressive in her road program. The influx of tourists has perhaps influenced the road building along the coast, with the result that there is a good road from the port of La Guaira to Caracas, the capital, and also from Puerto Cabello through Valencia and on to Caracas. The report of the Bureau of Foreign and Domestic Commerce for 1933 credits Venezuela with 2,211 miles of roads of which 165 miles are of cement concrete, 5 miles of bituminous concrete, 985 miles of improved earth roads and 1,056 miles of unimproved dirt roads.

Bolivia, Uruguay and Paraguay

Such vast sections of Bolivia are as yet unpopulated except by the Indians and so much of it still unexplored that there remains a comparatively small section where roads are in existence. Also there are thousands of miles of navigable rivers in the forested lowlands, furnishing practically all the necessary means of transportation. In 1933 Bolivia was reported to have a total of 3,790 miles of road, the types not specified but it can be assumed that much of that mileage is merely trails.

Uruguay is reported to have had, in 1933, 22,487 miles of roads, of which 60 miles was cement concrete, 185 miles of macadam surface-treated penetration, 343 miles of waterbound macadam, 1,395 miles of improved dirt roads and the remainder unimproved dirt roads.

Paraguay is reported to have had, in 1933, 3,674 miles of dirt road, of which 14 miles were improved.

West Indies

All road construction in Haiti is carried on by the Government under the supervision of the Department of Public Works and is financed by a special fund set aside yearly in the annual budget for this purpose. At the end of 1933, Haiti had 1,204.7 miles of roads of all types as compared with 1,129.8 miles for the preceding year. Much of the work done however was maintenance of existing roads and the construction of bridges. Of the 1,204.7 miles, about 5 miles are of bituminous macadam, 25.3 miles are of improved gravel and the remainder is unimproved dirt roads and trails. The improvement of Haiti's road system is going ahead as rapidly as finances permit.

In 1935 three appropriations of funds by the Consejo de Secretarios of Cuba were used to carry forward certain speci-

(Continued on following page)

Plans for Future Roads in South America

(Continued from preceding page)

fied road repair and construction work under the direction of the Department of Public Works. These sums, totaling 365,000 pesos, were extra-budgetary allotments, and were anticipated by the Public Works Department when the tentative plans for the 1935-36 program of highway construction was drawn up. They are part of a series of appropriations which may total 1,500,000 pesos during the course of the present fiscal year.

Of the appropriated money, 290,000 pesos will be used to continue the repair work now being undertaken on a number of streets and highways throughout the Island and 75,000 pesos will be used to inaugurate construction on several short roads in the country districts. Some minor repairs to the Central Highway of Cuba will also be undertaken.

Cuba has approximately 2,474 miles of highways of all types.

About 1908 the first step toward the construction of a general highway system for the Dominican Republic was initiated. Between that year and 1916 a total of about 47 miles was completed.

Today there are three principal highways known by the names of the patriots Duarte, Mella and Sanchez. The Duarte highway, nearly 186 miles in length, extends from north to south, dividing the Republic into two parts, connecting the interior with the port of Santo Domingo on the southern coast and with Monte Cristi and Puerto Plata in the north. The second highway of importance, known as the Mella, and about 109 miles long, extends in an easterly direction. The Sanchez highway affords communication between the capital, Santo Domingo, and Port-au-Prince, the capital of Haiti.

Work on these highways and on feeder roads is gradually being extended and a considerable amount of a $10,000,000 loan obtained by the Republic was set aside and is being used for highway construction. The Republic today has a total of more than 800 miles of good roads.

Area and Road Mileage

South America

Country	Area Square Miles	Road Mileage	Area to Mile of Road
Argentine	1,153,417	138,000	8.4
Bolivia	613,899	6,835	89.8
Brasil	3,280,000	92,441	35.3
British Guiana	89,480	832	10.7
Chile	286,396	24,356	11.3
Colombia	497,300	17,086*	29.1
Ecuador	174,000	4,250	40.9
French Guiana	34,740	28	1,240.8
Paraguay	176,000	3,674	47.9
Peru	524,800	11,703	44.8
Uruguay	72,172	22,487	3.2
Venezuela	393,976	5,281	74.6
Total	7,296,180	326,973	22.3

*About 12,000 miles are considered as trails

West Indies

Bahamas	4,404	419	10.5
Barbadoes	166	480	0.3
Bermudas	19	100	0.2
Cuba	44,164	2,474	17.8
Dominican Rep.	19,332	1,083	17.9
Guadeloupe	688	596	1.2
Haiti	10,207	1,212	8.4
Jamaica	4,450	6,832	0.7
Leeward Isl.	715	527	1.3
Martinique	385	721	0.5
Netherland W.I.	403	279	1.4
Puerto Rico	3,435	2,286	1.6
Trinidad & Tobago	1,976	2,345	0.8
Virgin Is.	132	178	0.7
Windward Is.	516	760	0.7
Total	90,992	20,292	4.5

We are indebted to the Pan American Union, the Bureau of Foreign and Domestic Commerce, the American Brazilian Association and the Consulates of Ecuador, Haiti and Argentine in New York for their cooperation in furnishing information and source material for this article.

The best rise in recovery followed the invalidation of NRA by the Supreme Court, and the termination of over-regulation of business. A relinquishment of Federal dominance, and a return to the policies that existed for so many years with regular Federal-Aid work would restore to highway contractors their confidence, their courage, their efficiency, their initiative, and permit them, also, to share in the growing recovery and to resume their rightful place in the economic life of the nation.—Frederick Hoitt, Secretary, New England Roaders' Association.

Mead Appointed Manager of P & H Chicago Office

Announcement has been made by the Harnischfeger Corp. of Milwaukee of the appointment of R. L. Mead as Manager of the corporation's Chicago office at 20 North Wacker Drive. Well-known through his fifteen years of activity in the field of material handling equipment, Mr. Mead was for six years with the Industrial Brownhoist Co. Subsequently he has been associated with the Ohio Locomotive Crane Co., McMyler Interstate Co. and most recently with the Link Belt Co. as District Sales Manager.

Mead takes charge in the Chicago territory of the sales for the complete line of Harnischfeger products including excavators, cranes, hoists, and welders.

Standard Agreement on Aggregate Sizes

A proposed Simplified Practice Recommendation for coarse aggregates has been submitted to producers, distributors, users and other interests for consideration and acceptance by the Division of Simplified Practice, National Bureau of Standards. The proposal was prepared by the Joint Technical Committee of the Mineral Aggregates Associations to develop standard sizes for coarse aggregates. This has been an important aim of producers and users of crushed stone, sand and gravel, and slag for many years. As early as 1920 a tentative, "Specification for Commercial Sizes of Sand and Gravel for Highway Construction" was published by the American Society for Testing Materials, and in 1923, that Society published a tentative "Specification for Commercial Sizes of Broken Stone and Broken Slag for Highway Construction". These tentative specifications did not receive enough support to warrant their acceptance as standards.

From 1924 to 1930 the National Crushed Stone Association, the National Sand and Gravel Association, and the National Slag Association, carried out work independently, to develop standard sizes. In order to make this work effective the Joint Technical Committee of Mineral Aggregates Associations was formed in 1930 to undertake the joint recommendations for standard sizes.

Since some engineers preferred round opening laboratory screens, and others square opening sieves, it was difficult to get started. For a long time specifications for concrete aggregates were written in terms of square openings while those for bituminous road work were generally expressed in terms of round openings. Many of the state highway departments using round opening screens have now adopted square openings as have many other important specifying bodies. Thus, the principal obstacle to standardization of sizes is rapidly disappearing and now the Joint Committee is proposing standards for the consideration of producers and users of mineral aggregates. Copies of the proposed Simplified Practice Recommendation may be obtained from Edwin W. Ely, Chief, Division of Simplified Practice, National Bureau of Standards, Washington, D.C. The sizes are based on sieves with square openings and are divided into two groups, A and B, each of which is subdivided into "primary" and "combined and modified" sizes.

A study of the two groups shows that they overlap and include apparent duplications. It is emphasized, however, that it is not intended that all or any portion of the sizes from both groups will be adopted for any one locality. In any marketing area, it is expected that specifications will be based on either Group A or B, whichever best fits local conditions. In general it is expected that the group selected will be that which leads to the least change in current specifications.

The undesirability of having two groups is recognized and efforts have been made to combine them into one. Careful studies of local conditions, however, have led to the conclusion that this is impracticable in this first step towards standardization. If, within the course of the next few years, general acceptance of the two groups is obtained, a great advance will have been made. When that condition is brought about, consideration should be given to carrying out the next step of endeavoring to combine the two groups into one.

The Committee has recognized that each of the two groups, as originally set up, omitted certain important sizes, and, accordingly, some Group A sizes have been included in Group B and some Group B sizes in Group A. With these additions it is believed that each group includes a full complement of sizes.

The report emphasizes that although the sizes are stated in terms of laboratory sieves with square openings, this has no bearing on the shape of opening to be used in plant equipment. The standard sizes can be made in the plant over round, square, or oblong screen openings by a proper selection of size of opening to produce the desired result.

The proposed standard sizes have already found wide acceptance and form the basis for specifications of such organizations as the American Society for Testing Materials, the American Concrete Institute, the Federal Specifications Board, the American Association of State Highway Officials, several state highway departments, and many other organizations. The Joint Committee recognizes that the general use of these proposed standards depends upon their acceptance by the consumer group and it earnestly believes that their adoption will be of mutual benefit to both consumer and producer.

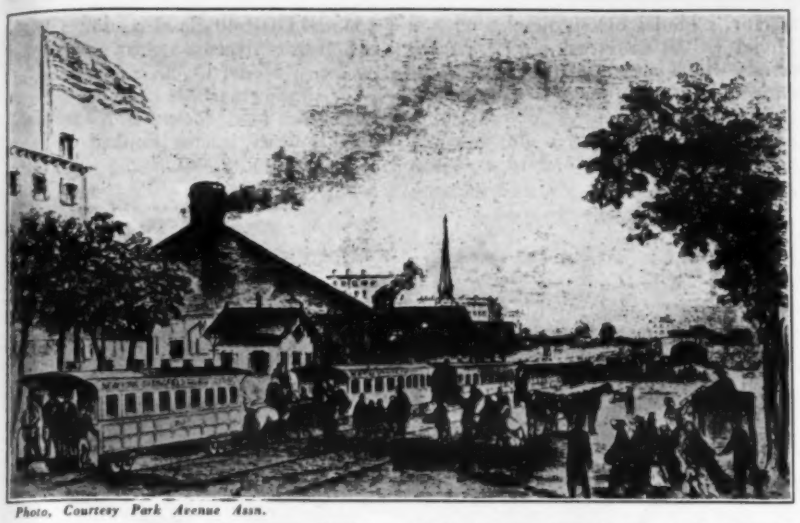
The reasons why county officials are occasionally neglectful of the condition of their highways and appurtenances is because their Boards will not finance them as the Boards do not feel that they are liable for accidents because of existing legal principles which class counties as quasi-municipal corporations not liable for damage caused by defective roads and bridges under their control. (There are exceptions in some states.)

—P. J. Zisch, Director, Counties Research Bureau, Milwaukee, Wis.

New Blue-Printing Machine

The new Pease Model 7 continuous blue-printing machine, just announced by the C. F. Pease Co., 813-821 North Franklin St., Chicago, Ill., was developed to meet the demand for continuous printing of moderate requirements, reproducing quickly and economically tracings, charts, diagrams, bulletins, etc. in a variety of forms in any dimensions up to 42 inches in width.

It is of the horizontal type and is modernly styled in an upright console design with pedestal type base. Among its features is simplicity of operation, and a person of average stature can comfortably and efficiently operate all controls. It is driven by means of a sturdy, special variable speed motor and all speeds are controlled by a 28-point rheostat located at the right hand side of the machine. An extension cord and detachable plug are provided as standard equipment and the machine can be connected into any electrical circuit of 20-ampere capacity not exceeding 100 volts ac or dc. Illumination is provided by means of electric mercury-vapor tubes.



Photo, Courtesy Park Avenue Assn.

Changing Horses for the "Iron Steed" on Park Avenue Just South of the Tunnel (Seen in the Background) in the Sixties. The Building with the Flag Is the Site of the Present Editorial Offices of Contractors and Engineers Monthly.

New York Modernizes Park Avenue Tunnel

Line of First Railroad and Street Car Line in Manhattan Paved for Motor Vehicles

(Photo on page 44)

IT is a far cry from New York's early steam railways, the first of which ran down Fourth Avenue to City Hall, to the construction of the famous Park Avenue Tunnel from 34th to 42nd Streets and its present reconstruction as a motor highway. Early in the nineteenth century the New York Central ran trains over this route in an open cut. The Tunnel, which is 2,050 feet in length, was not built until about 1852 and through it coaches were drawn by horses from 42nd Street to 32nd Street and hitched to the steam trains there, at the present site of the editorial and business offices of CONTRACTORS AND ENGINEERS MONTHLY.

Later on, about 1872, the New York Central stopped running trains south from 42nd Street and the tunnel was used exclusively for a horse-drawn railway, but was later electrified and used until early in 1935 by the Madison Avenue carline of the New York Railway System. On February 1, 1935, street railway traffic was discontinued, the Madison Avenue Coach Co. began using busses instead of trolly cars and abandoned the tunnel.

The use of this tunnel for non-commercial vehicular traffic was suggested and as a result, under WPA, it is now being paved with a concrete pavement in two 11-foot strips providing 22 feet of pavement between curbs. In addition to this the tunnel walls are being renovated and air blowers installed, completing a most interesting cycle of transportation on historic Fourth and Park Avenues.

New Concrete Vibrators Are Pneumatic Powered

A rather complete line of pneumatic vibrators for concrete placement has been announced recently by The Berkshire Mfg. Co., 1101 Power Ave., Cleveland, Ohio. They are divided into Vibra-Tube spades for the internal vibration of concrete and Models B-1 and B-2 which are designed for use as both external and internal vibrators, depending on the attachments used.

The Vibra-Tube spades are lightweight, have a double action piston and only two moving parts. They are made in two sizes with three interchangeable handles and are claimed to have the low air consumption of 30 cubic feet per minute at 90 pounds line pressure.

The Models B-1 and B-2 are designed particularly for small jobs. The SD styles are for work such as walls, floors and small mass sections up to 5 or 6 feet. A wood spud, either a 2 x 4 or 2 x 8, can be used up to 8 to 10 feet lengths. The PS styles are adapted to work where the SD spud is too large. The steel spud of this style is suitable for working in and around narrow or reinforced sections, such as bridge decks, piling, and thin walls. The EM styles have an end mounting clamp with jaws so that they may be attached to either wood or metal forms. The SWC styles have side mounting clamps with jaws that open to 8½ inches and are designed for use on wall forms. The WF styles have smaller side mounting clamps and the PE style is interchangeable with all other B-2 vibrators and is used for vibrating concrete pipe up to 36 inches in diameter.

Complete information on these vibrators may be secured by readers of this magazine direct from the Berkshire Mfg. Co.

Streamline Maintainer Shown at Road Show

A streamline FWD road maintainer unit was the main feature of the exhibit of the Four Wheel Drive Auto Co., of Clintonville, Wis., at the Road Show in Cleveland last month. Although designed and constructed particularly for road maintenance and highway construction use, utility and pleasing appearance have been combined in the unit by means of the streamlining of fenders, hood and cab.

The engine develops 85 bhp. The wheelbase is 148 inches and on the heat-treated frame is mounted a 2½-yard dump body. Located transversely under the center of the truck is an electric hydraulic spring scraper with a 10-foot blade. Six forward speeds and two reverse are provided by a sliding gear-type transmission. This arrangement actually gives three maintaining speeds and three hauling or road speeds.

Safety and dependability are assured through the added traction of four-driving wheels, shatterproof glass in the cab and four-wheel hydraulic brakes which are booster-operated.

The unit is a multiple-purpose one. It can be used for grading with the underbody blade; as a power unit to haul trailers, ditch-graders, mowing machines and other specialized equipment; to haul loads such as snow fence, sand or gravel and construction equipment; and as a unit for pushing a snow plow.

Taxes measured by the mile are entirely proper for road construction, maintenance, and administration purposes, but they are entirely improper and indefensible as a source of revenue for general governmental needs, however urgent those needs may be.—Roy F. Britton, Director, National Highway Users Association.

Some Highlights of A.R.B.A. Road Show

(Continued from page 21)

ring Co. exhibit of a 5.77-cubic yard Trail Dump, a 5½-yard Dumptor and a Quik-Mix mixer with a 2-yard 801 Koehring shovel powered with a Wisconsin 200-hp motor standing guard over all. A Mud Jack on the upper floor looked down on this impressive exhibit.

The Austin-Western Road Machinery Co. exhibit had striking fireman's red corners with illuminated tinted transparencies. The big machines were packed in close but held the attention of the visitor. There was a Model 77 Senior motor grader with hydraulic power control, a No. 10 power control blade grader, a 12-yard hydraulic scraper, a complete portable crushing plant, a 10-ton Roll-a-Plane, a Badger shovel, an open-air movie theatre and a bench on which were assembled comparisons of hydraulic and mechanical controls.

Bucyrus-Erie had a central display of transparencies which concealed a most convenient cloak room. Around this were displayed one of the new bulldozers mounted on a TracTracTor Model 40 and the new Bullgrader on another tractor. One of the big Bucyrus-Erie 48-B 2-yard machines powered by a Buda 170-hp diesel and the little 10-B ⅜-yard machine powered with a Hercules 35-54-hp motor were shown. In back of the exhibit a large book dramatized the features and owners of 10-B shovels. On one table was a geometric display of the 138 anti-friction bearings used in the 48-B machine. Black and orange were the featured colors for the decorations which set off the green machines.

International Harvester set a stage for itself on the ramp and mezzanine at the far end of the lower exhibit hall. It had a striking display of power units all painted fireman's red, ½, 1½, and 5-7-ton trucks, a 6-wheel model truck, a cutaway diesel engine, a diesel-powered TracTracTor 40 and a Model 20 TracTracTor. An ingenious use of Neon lights demonstrated the progressive filtration system for International units using fuel oil. Ecru hangings and colored floodlights lent a rainbow background to the exhibit. The "International Theatre" at one end of the exhibit had an almost continuous performance of seven reels of motor truck and tractor scenes in sound. Three of the reels were semi-technical, dealing with diesel engine construction and operation. Oh yes, we must not forget the TracTracTor 40 complete with cab, the International 30 with dual pneumatic tires and the International 12 equipped with a highway mower. Festooned along the hangings were enlarged photographs of factory scenes. The new PA 100 power unit, a 6-cylinder gas engine model, was shown for the first time.

R. G. LeTourneau packed more mastodons into a given floor area than any one at the Show. As you walked by, you felt you were looking at the New York skyline or were lost in Grand Canyon. The new 24-yard Carryall scraper and the 30-yard Cradledump Buggy were shown with Caterpillar tractors.

Caterpillar Tractor Co. offered a combined exhibit with many companies whose products are used in conjunction with its diesel or gas tractors. The Caterpillar exhibit included an open-air theatre and a wide open exhibit with attractive corners, cut-away models of tractors, the 10,000th Caterpillar diesel, a diesel Auto Patrol, a Sixty-Six power-controlled grader and a Forty-Eight power-controlled elevating grader. The companies which exhibited in conjunction with Caterpillar were John Deere Tractor Co., Athey Truss Wheel Co., Electric Wheel Co., Iowa Mfg. Co., Baker Mfg. Co., Blaw-Knox Co., Hug Co., R. G. LeTourneau, Inc., Bucyrus-Erie Co. (industrial units), Gar Wood Industries, Inc., Willamette Hyster Co., LaPlant-Choate Mfg. Co., Killefer Mfg. Corp., Ltd., Gardner-Denver Co., and Anthony Co., Inc.

Calcium Chloride Assn. showed an animated model of a complete stabilized plant-mix unit with aggregate bins, a binder soil feeder, a disintegrator and crusher, calcium chloride feed, water tank, belt conveyor, and a pug mill delivering to a dump truck. The exhibit had a striking green and chromium trimmed background reminiscent of Century of Progress architecture.

The Owen Bucket Co., exhibit caught your eye immediately with its two red silhouetted lions rampant and the slogan, "A Mouthful at Every Bite." The booth was equipped with comfortable leather and chrome seats and red encircling walls. A ¾-yard standard digging bucket and models of the new rock grapple were shown.

With a brilliant orange predominant, Allis Chalmers Mfg. Co. welcomed visitors to its open-air talkies and to examine the twelve pieces of equipment displayed. They included the Speed Ace 7½-yard hauling unit with wheels in motion, a pneumatic-tired IU35 industrial tractor, four power units of 25, 60, 90 and 102 hp, an LO tractor, a No. 54 speed patrol motor grader with power control, and a No. 14 power control blade grader.

Have Your Picture Took?

Novo Engine Co. took your photograph and delivered it in 25 seconds—free—and showed its lines of self-priming centrifugals and other well-known Novo products.

You just couldn't pass by the Blaw-Knox exhibit, even though the equipment was packed in pretty tight. The exhibit included a Truk Mixer with an improved 2-piece chute, batchers, forms, etc., and on the floor below the sheepsfoot roller with its oscillating feature and arrangement for hauling in tandem and a device for cleaning the teeth. The new bulldozer was also shown as was the Blaw-Knox dirt mover.

The only booth to display the American flag in this huge exhibit of American road building equipment was the combined display of Osgood, Hercules and General Excavator Companies. Their booth was brilliantly lighted, attracting attention to it across the display of heavy equipment.

Striking blue gate posts with illuminated panels at the entrances and linoleum treads with Cletrac track insets caught your attention as you approached the Cleveland Tractor Co. exhibit which featured a Model 35 Hillside Cletrac tractor with cab, a duplicate of the tractor which Admiral Byrd took to Little America and operated at 65 degrees below zero. Lieut. Commander Noville was in attendance at the booth throughout the Show, telling interesting stories of the expedition and explaining the various articles of clothing and equipment which were displayed about the tractor. The remainder of the exhibit included a Model FG-80 gas-powered tractor connected to an Austin-Western 12-yard scraper, a Model AG-20 tractor, a Model BD-30 diesel tractor, a Model BG-30 gas tractor with rubber treads which was used to move in the entire Cletrac exhibit as well as handle the heavy equipment of several other near-by manufacturers, a duplicate of this same unit with standard crawlers, a Model DDH-40 diesel tractor, a Model BD-30 gas tractor with a front-end loader, a Model CG-35 gas tractor, another similar machine carrying a Davey 230-cubic foot compressor, a Model FD-80 diesel tractor hooked up to a

(Continued on following page)

Some Highlights of A.R.B.A. Road Show

(Continued from preceding page)

Gar Wood pneumatic-tired buggy and also carrying a Gar Wood bulldozer, and a Model EN tractor with an enclosed cab and a Sargent sidewalk plow and equipped with rubber grousers. In conjunction with this exhibit was a display of the Greenlee Tool Co. of Rockford Ill., showing tools for assembling Cletrac tracks.

"And the Music Goes 'Round and 'Round" sang the darkie quartet in the Cleveland Rock Drill Co.'s exhibit where a full line of wagon drills and jack hammers were displayed in orderly array.

Fun for Kiddies and Adults

The youngsters of a few dozen contractors are going to raise Cain when they learn that Sta-Tite rubber latex expansion joint material when first mixed makes wonderful watertight putty for the manufacture of fish bowls using just five rectangular pieces of glass. McCarty Analine & Extract Corp. had such a fish bowl with a happy family of goldfish sporting among the water weeds and surrounding it were samples showing the stick-to-it-iveness of this new non-extruding expansion joint filler.

Ingersoll-Rand had a highly illuminated display of jack hammers, portable compressors, air hoists, drills, an oil furnace and a sharpener and display boards of 30-millimeter to 4½-inch detachable bits with a background of blue hangings.

Dinosaurs?—Oh yes, Sinclair Refining Co. had earthenware jars of the various Sinclair lubricants and at the back of the booth cut-outs of the famous Sinclair dinosaurs which have become so well known in its advertising, Century of Progress exhibit and the toy balloons which featured many earlier Road Shows.

If you missed the beer geyser at the lunch counter near the entrance of the show Wednesday afternoon, you can weep, not only because you did not see the startling display of suds but also for the waste of such good refreshing drinks.

We have had "Color in the Kitchen" for several years but this year the artistic displays of the manufacturers truly brought color to the Road Show.

Let's Be Serious About Safety

Aetna Casualty & Surety Co. and Cleveland Police Department put on a safety show in the entrance lobby which included safety movies, a machine that tested a driver's reaction time in using his brakes, a device for estimating the passing distance of automobiles, a steering test, a glare test, and a light reflection test. The line of waiting participants almost equalled the line of vanity personified that stood in front of the free photo booth at the Novo exhibit.

The Republic of Mexico had an attractive and instructive exhibit, and the Missouri State Highway Department's panels and booths strikingly urged safer driving. The Province of Quebec and the Highway Department of West Virginia distributed maps and booklets inviting visitors to these two touring paradises. We must not overlook the Question Box of the U. S. Bureau of Public Roads. A series of models and paintings depicted many problems of highway construction, reproductions of which appear on page 44.

With seven-eighths of Ohio's rural population living on secondary roads and one-third of these still mud roads and the rest badly in need of maintenance and repair we see a very grave need for an adequate secondary road program.
—Dallas Sullivan, Budget Director, Ohio Good Roads Federation.

3,000 Miles of Roads Improved by Minnesota

The Minnesota Highway Department improved the condition of more than 3,000 miles of trunk highways in 1935, according to a summary of the year's work announced by Commissioner N. W. Elsberg.

The improvements included: 228 miles of grading; 42 miles of regrading; 162 miles of new graveling; 450 miles of re-graveling; 318 miles of new bituminous treatment; 1,440 miles of bituminous retreatment; 85 miles of bituminous shoulder treatment; 78 miles of plant-mix bituminous surfacing; 103 miles of concrete paving completed or under contract; 87 miles of subgrade treatment; 10 miles of gravel lifts and 130 miles of dust laying treatment. The department also constructed more than fifty bridges and eliminated thirty-nine railway grade crossings.

More than sixty roadside development projects, increasing the beauty and safety of the highways, were carried out. These were largely done as relief labor projects or with other special Federal funds. Civilian Conservation Corps camps cooperated with the department on a considerable amount of this work. The projects included the obliteration of construction scars, widening of shoulders, flattening and seeding of slopes, construction of roadside parking areas and cooperation with local communities in developing park sites along the highways.

Road Relocation Cuts Cost of Maintenance and Use

It pays a state to spend money for highway relocation when a route is shortened, hazardous curves are eliminated, and maintenance costs are reduced. West Virginia offers an excellent example in the new Bluefield-Princeton relocation. The road passes through rough country and the old road followed a route which gave the easiest possible grade.

Before the road was improved, the State Highway Commission made a careful study of new locations. Based on these studies, a new route was established which shortened the distance from 10.4 miles to 8.27 miles, saving 2.13 miles. The savings which have been effected include a lower cost to motorists because of the shorter distance, lower maintenance cost because of the improved surface, and lower car operation costs because of the smoother surface.

A computation of the cost of vehicle operation and road maintenance for the old and new road shows a reduction of $161,356.02 per year as the result of the improvement. Based on an average traffic of 2,000 cars per day, these costs on the old road were $491,518.35 per year; and on the new road $330,162.32.

Mules vs. Draglines

The All-American Canal offers a very interesting example of the cost of moving dirt by the older and most modern methods. Boyce & Igo, contractor on this project, is using draglines costing as much as $250,000 each and equipped with 175-foot booms and 12-yard buckets. The bid price on moving dirt was 6 cents per cubic yard. Some of the work is being handled by force account in order to take care of Imperial Valley residents as a relief project. On this work mule teams are being used and the cost of moving the dirt is 20 cents per cubic yard, according to A. J. Ackerman, Construction Plant Engineer, TVA, in a paper presented before the Construction Division, American Society of Civil Engineers.

New Heavy-Duty Mixers

Koehring has announced new 28-S, 56-S and 84-S heavy-duty mixers for the construction industry. These mixers are equipped for gasoline or electric power with an enclosed V-belt drive to the reduction gear case.

The equipment includes a swinging door which is self-locking in both open and closed position on the batch hopper, a charging chute with replaceable liners, power discharge, either overhead or bottom control levers and a batchmeter. Complete information will be found in a new catalog which may be secured from the Koehring Co., 3026 W. Concordia Ave., Milwaukee, Wis.

Bulletins and Pamphlets

For free distribution to contractors, engineers and officials. Write for the catalogs you need.

Modern Concrete-Handling Methods

593 Chain Belt Co., 1666 West Bruce St., Milwaukee, Wis., will be glad to send on request complete information on the Rex methods of handling concrete, including Rex Moto-Mixers for the transportation of concrete from batcher to the job, and the Rex Pumpcrete for placing concrete in the forms.

Tires for Positive Traction

594 Firestone Tire & Rubber Co., Akron, Ohio, will be glad to send to those interested complete information on Firestone Ground Grip tires for trucks and construction equipment which are designed to provide positive traction to save wear and tear on the equipment and speed up the work.

Portable Compressors and Tools

595 Literature describing the complete line of Worthington portable air compressors and contractors' tools, including wagon and rock drills, pavement breakers, clay diggers and tampers, may be secured upon request from the Worthington Pump & Machinery Corp., Harrison, N. J.

An Improved Bituminous Distributor

596 The Model F02 Etnyre bituminous distributor has a more compact assembly, new leakless valves, and a new fifth-wheel-driven tachometer to insure accuracy. Bulletin 504 describing this new effective distributor may be secured from E. D. Etnyre & Co., 400 Jefferson St., Oregon, Ill.

Dowel Bar Support for Transverse Joints

597 Wheeling Corrugating Co., Wheeling, W. Va., will be glad to send to interested contractors and engineers complete information on the new Wheeling dowel bar support for transverse joints in concrete highways, which provides a new method of installing expansion and contraction joints quickly and economically.

Disc Spreader for Sand or Chloride

598 Kob Mfg. Co., 329 E. Brown St., Milwaukee, Wis., will be glad to send to interested contractors, state and county engineers complete information on the Kob disc spreader for sand, gravel, chips, cinders or calcium chloride.

Is It Mixers You Want?

599 If your answer is "yes" you will be interested in the latest catalog of Construction Machinery Co., 500 Glenwood Ave., Waterloo, Iowa, which has complete descriptions of Master and Silverstreak drum-type mixers as well as plaster and mortar mixers and Wonder tilting mixers.

Complete Line of Crushing Equipment

600 Telsmith crushing equipment, which was selected for use at Grand Coulee, is described and illustrated in Bulletin C-34 which the Smith Engineering Works, 4014 No. Holton St., Milwaukee, Wis., will be glad to send on request.

Low-Cost Excavating With Slacklines

601 The new catalog recently issued by Sauerman Bros., 464 S. Clinton St., Chicago, Ill., shows how excavating costs can be reduced with the use of Sauerman slacklines and drag scrapers which dig, haul and place the dirt, reaching from 100 to 1,500 feet.

Two-Drum Paver

602 The Ransome Dual-Drum paver, designed to speed up the mixing and laying of concrete, is described and illustrated in literature which the Ransome Concrete Machinery Co., Dunellen, N. J., will send on request.

Metal Accessories for Highway Work

603 Servicised Products Corp., 6051 W. 65th St., Chicago, Ill., will furnish contractors and engineers with complete details on Servicised metal accessories for expansion joints for highways on request.

Pneumatic Concrete Vibrators

604 Complete information on Berkshire pneumatic concrete vibrators, in both the internal and external types, for dams, bridges, piling, columns and similar concrete construction, may be secured direct from the Berkshire Mfg. Co., 1100 Power Ave., Cleveland, Ohio.

Free Copy of Driller's Handbook

605 Free copies of the Driller's Handbook, issued by the Cleveland Rock Drill Co., 3736 E. 78th St., Cleveland, Ohio, may be secured by readers of this magazine by writing direct to the company and mentioning the type of machines used, whether hand hammer drills, pavement breakers, clay diggers, tampers or wagon drills.

Fast Working Construction Equipment

606 Blaw-Knox Co., 2067 Farmers Bank Bldg., Pittsburgh, Pa., has developed a wide line of construction equipment including Batcherplants, Road Finish-Spreaders, Trukmixer batching plants, bulldozers, steel road forms, Trukmixers and agitators, bulk cement plants, clamshell buckets and gas-electric road finishers. Information on any or all of these types of construction equipment may be secured direct from Blaw-Knox Co.

Blade and V-Type Snow Plows

607 The Heil Co., 3000 W. Montana St., Milwaukee, Wis., will be glad to send to interested state and county highway and maintenance engineers its complete catalog describing Hi-Speed safety snow plows, in the blade or V types, which are operated by hand hydraulic cab control and are easily attached and detached.

New Trail Dump Wagon

608 Complete information on the new Trail-Dump wagon, features of which are its mono-plate box-type welded body construction, light weight for maximum pay load, free swinging doors, high arched rear axle for maximum dumping clearance, short turning radius and speed, may be secured by interested contractors from the Koehring Co., 3026 W. Concordia Ave., Milwaukee, Wis.

All Types of Pull Graders

609 The Galion Iron Works & Mfg. Co., Galion, Ohio, offers a Galion pull-type grader of the exact size and weight to meet any requirement calling for this type of equipment, all the way from the Galion Pony grader weighing 1,395 pounds to the big 14,000-pound No. 14 grader available with hydraulic control. Complete information will be sent you on request.

New Handbook on Lubrication

610 Copies of its new handbook "The Case of Alemite vs. Friction," containing complete information on the Alemite system of pressure lubrication, are available free to interested contractors and engineers by writing the Alemite Division, Stewart-Warner Corp., 1850 Diversey Parkway, Chicago, Ill., and mentioning this magazine.

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Compressors with Automatic Control

611 Chrysler portable air compressors, a feature of which is the full automatic control, are described in a new completely illustrated catalog which the Chrysler Corp., Amplex Division, Detroit, Mich., will be glad to send on request.

Working in the Dry

612 Catalog A describing Griffin wellpoint systems for dewatering quicksand and wet subsoil to insure working in the dry may be secured by interested contractors and engineers direct from the Griffin Wellpoint Corp., 60 E. 42nd St., New York City.

Bins and Batchers

613 Butler Bin Co., Waukesha, Wis., will be glad to send on request complete information on the latest Butler developments in its line of bins and batchers, features of which are accurate batching, simple operation, easy erection, dismantling and transportation, and simplicity of design and construction.

Steel Forms for Concrete Work

614 Catalog 200, describing Heltzel steel forms for roads, sidewalks, curb and gutters, pipe lines, walls, sewers and tunnels, including the Heltzel Rigid Radius forms, may be secured by those interested direct from the Heltzel Steel Form & Iron Co., Warren, Ohio.

Crushers and Crushing Plants

615 Universal crushers and crushing plants, portable or stationary, which are designed for the economical and speedy production of aggregates, are described in literature which the Universal Crusher Co., 620 C Ave., West, Cedar Rapids, Iowa, will be glad to send on request.

Heavy-Duty Stationary Compressor

616 A new Bulletin, No. 3162, describing its line of power-driven, horizontal duplex, double-acting, cross-head type, moderate speed, heavy-duty air compressors has just been issued by Ingersoll-Rand Co., 11 Broadway, New York City. Copies of the bulletin covering this XR line units will be furnished gratis on request.

Steel Wheels for Portable Equipment

617 Electric steel wheels for all types of portable equipment are described in Bulletins 250 and 265 which the Electric Wheel Co., Dept. CM, Quincy, Ill., will be glad to send on request.

A 1936 Model Shovel

618 The 48-B Bulletin, recently published by the Bucyrus-Erie Co., South Milwaukee, Wis., contains a complete description of the new 1936 model 48-B shovel which is a thoroughly new unit, modern in all respects.

Building Low-Cost Roads

619 The Barret Co., 40 Rector St., New York City, will be glad to have engineers present their road planning problems to its Technical Service Bureau, the staff of which will be glad to make suggestions for low-cost economical roads of the future through the use of Tarvia.

Steam Pile Hammers and Extractors

620 The well-illustrated descriptive catalog of McKiernan-Terry Corp., 19 Park Row, New York City, gives complete details and the sizes of pile hammers and extractors best suited for different conditions on all kinds of jobs.

Three Types of Long-Lived Digging Buckets

621 Three types: multiple-rope, power-arm and dragline buckets, famous for output, long life and dependability are described in the bulletins of The Wellman Engineering Co., 7012 Central Ave., Cleveland, Ohio.

Daylight for Night Jobs

622 The National Carbide V-G light which spreads 8,000 candlepower over your job right where you need it giving daylight conditions on night jobs, is described in the catalogs of National Carbide Sales Corp., Lincoln Bldg., New York City.

New Series of 1936 Trucks

Featuring equalized load distribution, hydraulic brakes and Amola steel springs, the Dodge Division of Chrysler Corp., Detroit, Mich., has announced a new series of trucks and commercial cars for 1936. This new line will consist of the following chassis models: ½, ¾, 1, 1½ (in two series), 2, 3, and 4-ton models. Specially-built custom Airflow models also will be offered.

Among the important innovations marking this new line of trucks is the "fore point" load distribution, through which the load is shifted forward in relation to the axles. This insures greater stability, a minimum overall length, more nearly equalized wear on brakes and tires and in general, a more efficient hauling unit, according to the manufacturer.

One of the major changes in the construction of the new models is the adoption of a strictly truck type of frame on the ½-ton commercial car. This double drop frame is deeper in side rail cross section and has five truck-type cross members, including the rear engine support. Amola steel, a recent metallurgical development of the Chrysler Corp. which has high fatigue resisting qualities, is used in the springs of the entire 1936 line of trucks, furnishing an additional factor of safety.

New Windshield Wiper Most Useful on Icy Days

Made of soft, carbon-base rubber, with a hollow, perforated tube running its length, a new Rex-Hide balloon wiper blade has been announced by Rex-Hide, Inc., East Brady, Pa. Ten flexible wiping ribs create alternate areas of pressure and suction with the stroke, drawing water into the hollow tube through the perforations. The self-cleaning operation prevents the same water from being smeared back and forth across the windshield. To adapt it for use under extreme ice and snow conditions, an ordinary pipe cleaner can be dipped in glycerine, then bent in a hook at one end and hung inside the hollow tube of the Rex-Hide blade. This maintains a glycerine film on the windshield for several hours, removes sleet, and prevents the ice from forming on the glass.

The 17th annual convention of the Associated Equipment Distributors, held in Cleveland January 18-19, was the best attended convention ever held. The general outlook was optimistic and dealers are looking forward to a successful 1936.

The new officers elected at the meeting are: President, J. S. Gilman, Wm. H. Ziegler Co., Inc., Minneapolis; First Vice Pres., G. F. Lowe, Lowe-Hillsman Co., Chicago; Second Vice Pres., A. F. Sersanous, Loggers & Contractors Machinery Co., Portland, Ore.; Secy.-Treas., A. C. Blaisdell, Blaisdell-Folz Equipment Co., Cincinnati. The additional directors are John C. Louis, Baltimore; L. J. Moore, Memphis; E. K. Hurst, Sioux Falls, S. D.; T. W. Harron, San Francisco; and W. R. Armstrong, Atlanta.

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M & M Form Clamps
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Clyde Hoists, Derricks
Cleveland Formgraders
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Euclid Wagons, Scrapers
Gopher Road Signs
Haiss Loaders
Hercules Road Rollers
Hough-Universal Sweeper
Koppel Industrial Cars
McKiernan-Terry Pile Hammers, Extractors
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Michigan Power Shovel
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Northwest Shovels, Cranes
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Keystone Excavators, Blast Hole Drills
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Davey Air Compressors
Cleveland Rock Drills
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Blaw-Knox Ateco Scrapers, Bulldozers
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BUCYRUS-ERIE — Power Shovels, Cranes, Draglines
PIONEER—Crushers, Gravel Plants
REX—Mixers, Pavers, Mo-to-Mixers, Pumps, Saw Rigs
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GARDNER-DENVER—Air Compressors, Drills
LAPEER TRAILMOBILE—Semi-Trailers
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Lyle Signs, Inc.
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Diamond Iron Works, Inc.
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Skilsaw—Electric Saws, Drills
Skelton—Shovels
LeRoi—Engines
Symons—Column Clamps
Winslow—Weighing Scales
Universal—Form Clamps
Link-Belt—Cranes, Shovels, Draglines
Nove—Pumps
Vulcan—Steam and Drop Hammers
Waukesha—Engines
Mall—Vibrators and Grinders
Archer—Tower Equipment
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Buffalo-Springfield Road Rollers
D-A Lubricants, Oils
Hewitt Belting, Hose
Le Tourneau Dirt Moving, Road Bldg. Equip.
Kohler Lighting Plants
LaCrosse Tu-Way Trailers
Hough-Universal Road Sweepers
Standard Paving and Plant-Mix Oiling Plants, Distributors, Trailer Oilers and Retorts
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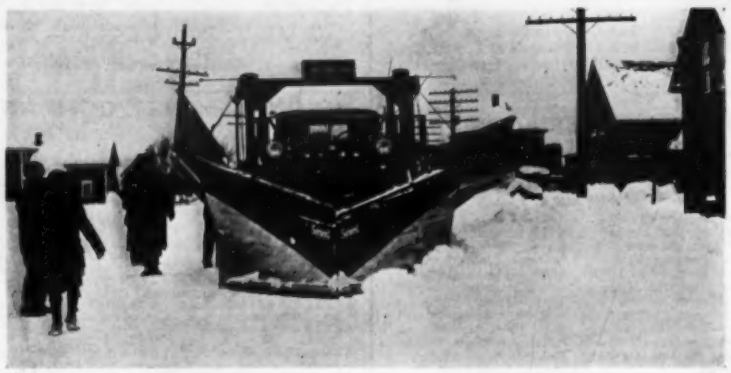
U. S. B. P. R. Photos

The Eight Pictorial Dioramas Exhibited at the Road Show by the U. S. Bureau of Public Roads as Its Answer to the Question "What's Ahead in Road Building?" A Huge Map of the United States Made Up of Photographs Showing Typical Road and Bridge Construction Throughout the Country Was Also Exhibited. The Dioramas Are: 1. The Oregon Trail in 1843. 2. A Worn-Out Road on a Narrow Right-of-Way. 3. A Streamline Highway on a Wide Right-of-Way. 4. A Railroad Grade Separation. 5. Eliminating Congestion at the Edge of a Large Industrial City. 6. An Arterial Highway Entering a Large City. 7. A By-Pass Around a Metropolis. 8. A Land Service Road.



Snow Plowing Activities Have Recently Taken a Jump in Maine. See Page 7.

Hauling Over the Heavy-Duty Timber and Steel Construction Bridge at Wills Creek Dam. See Page 15.

WPA Labor Finishing New Concrete Pavement in the Old Park Avenue Tunnel. See Page 35.

C. & E. M. Photos

Surface Texture of Penetration Macadam Near Orange, Mass., After One Month's Service. W. E. Sikes, Supt. Lane Constr. Co., of Meriden, Conn., See Page 1.

Only by diligent attention in each state, followed by aggressive resistence to diversion proposals and by urgent demands for repeal of present diversions can the evil of misappropriation of the motorists' special taxes be stopped.

Roy F. Britton, Director, National Hwy. Users Assn.

Automobile Club of N. Y. Review Photo

Pan-American Union Photo

Touring Club Peruano Photo

Mountain Highways in Brazil and Peru, Showing the Type of Engineering Difficulties To Be Encountered in Building South America's Future Roads. See Page 11.